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WITH WHICH IS CONSOLIDATED WESTERN ELECTRICIAN AND ELECTROCRAFT

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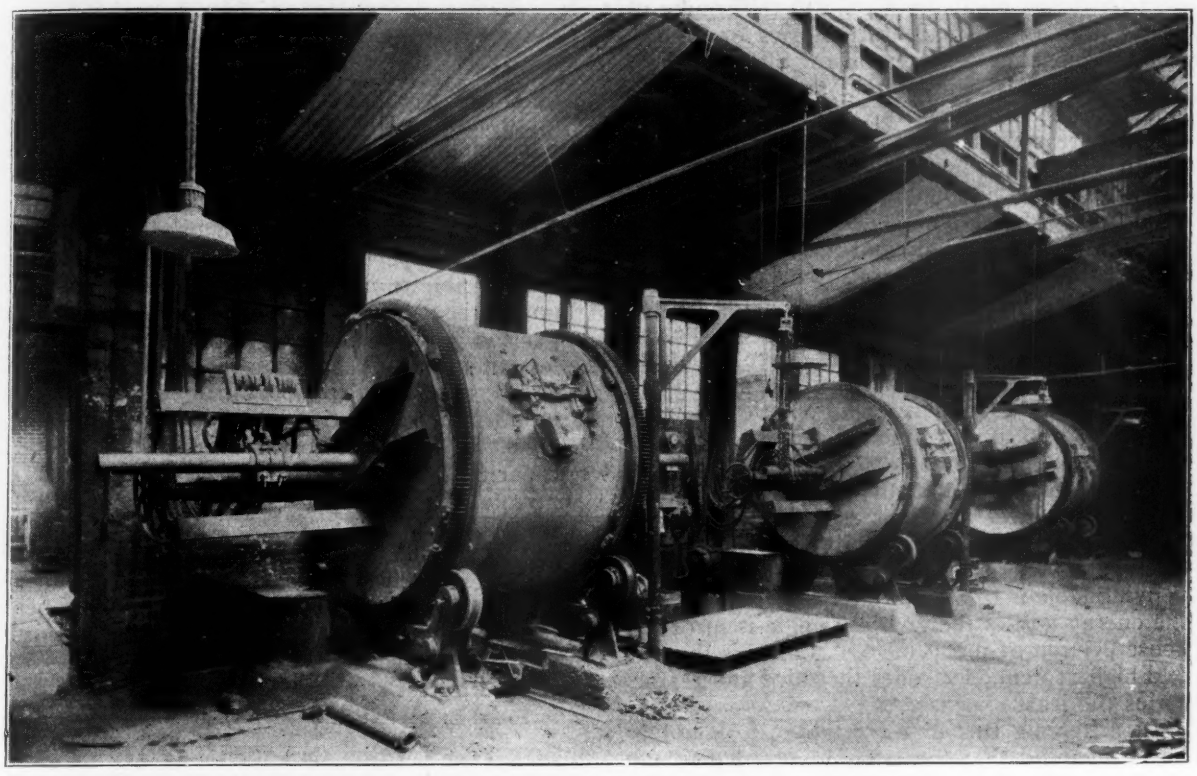


Fig. 1.—Foundry Installation of Rocking Furnaces for Melting Brass.

Some Practical Data on Operating Electric Brass Furnaces

Data on Metal Loss, Time and Energy Consumption per Heat for Number of Consecutive Heats—Statistics on Refractories

The electric furnace for melting brass and similar nonferrous alloys is already an important factor. At the same time, the electric furnace is as yet comparatively unknown as contrasted with the extent to which it could, and should, be employed. The electric furnace is a form of load that the central stations should welcome and aggressively canvass for their lines; and the electric furnace for brass melting is a type of furnace that the brass foundries will find well adapted to their needs—reliable, flexible, efficient in the use of heat and the production of metal, and one free from many of the ills that are part and parcel of other types of furnaces.

In going after the electric furnace load for melting ferrous and nonferrous metals, central-station power engineers have too often known too little about the actual service conditions, what the electric furnace can do, what it costs to do it, how long a furnace can remain in service without shutting down for relining, how long electrodes will last, and how many heats can be obtained consecutively, and so forth. In other words, the central stations have not familiarized themselves sufficiently with the actual operating facts on the electric furnace, the facts that the foundrymen want to know.

In the main, the facts have not been available. Those central-station men who would have liked to have the facts could not obtain them. The foundries possessing electric furnaces, knowing they had a good thing, were determined to keep it to themselves, as it gave them a very real advantage over their competitors. They feared, perhaps, that if they expressed their real satisfaction, that their energy rate might be raised. These, and many more, reasons are probably responsible for the fact that actual operating data

on electric furnaces have been sadly lacking. In the following it is aimed to remedy matters somewhat, by presenting actual foundry data collected from two reliable sources.

Few foundries maintain accurate or complete data as to the individual costs of the various items entering into the operation of their furnaces. This statement is true regardless of whether the furnace is heated by coal, oil, gas or electricity, and applies not only to the source of heat but to the furnace refractories or linings, labor, incidentals. The reason for the scarcity of actual operating data is that the foundry has looked to the result, not the method of obtaining it. Other reasons are that operating data are not obtained without some effort and expenditure of time. The less the trouble the greater the likelihood of data being obtained, and the more complete do they tend to be and the more accurate.

Data on the cost of operating an electric furnace of 2000 lbs. capacity are given in the accompanying table on the basis of cost per ton melted. This basis is the most convenient, since variations in the cost of labor, cost of electrodes and cost of energy are all taken care of automatically, when basing cost on tonnage melted.

The greater the number of consecutive heats obtained, within a limit, the greater the tonnage poured, the lower the labor and energy cost, and the less will be spent upon furnace linings and electrodes, per ton melted. Analyzing the accompanying table is of special interest. It shows that the energy cost is the greatest single item of expense per ton of metal melted. Labor is the second highest item, electrodes the third and refractories the least expense.

In analyzing this expense table, it should be borne in mind that the labor involved does not vary as the tonnage melted, and loss of time due any trouble that prevents melting, increases the labor cost per ton. The items that do actually vary directly with the metal melted are energy consumption, electrode and refractory deterioration; the variation is not in direct proportion to tonnage, obviously. The expense, per ton, will be somewhat higher on smaller furnaces, although the various items maintain their relative magnitude. In this connection, it should be pointed out that very often a lower cost per kw-hr. than 1 cent obtains. This immediately changes the cost per ton and will make the labor cost of even greater relative importance.

	Cost per ton
Electric energy (225 kw-hrs. at 1c)	$2.25
Refractories	.25
Electrodes	.63
Labor	1.42
Incidentals	.50
Interest and depreciation	.43
Total melting cost	$5.48

While low cost of melting is of importance, the real criterion is, of course, ability to produce uniform metal, or one whose variation may be foretold reasonably closely. A large automobile foundry that keeps a close watch on its metal obtained the accompanying data as to the analysis of thirteen meltings. In addition to the uniformity of analysis, this plant found that the tensile strength of the electrically melted metal was 40,000 lbs. per sq. in. as compared with 35,000 lbs. for the same metal melted in a combustion furnace.

	Copper.	Tin.	Lead.	Zinc.	Phos.
Average composition..	87.05	8.24	1.27	.342	.017
Average deviation....	0.22	0.26	0.10	0.23	.004
Maximum deviation..	0.75	0.60	0.36	0.54	.008

The time required per heat varies, of course, with the heat stored in the furnace, the initial temperature, average temperature, etc. In other words, a first heat will always require the largest energy input because of the heat storage capacity of the furnace or ability of the furnace to absorb heat. The second heat will take a lower energy input, and so on. This fact has emphasized the importance of obtaining as many consecutive heats as possible without serious interruption and thereby loss of heat stored in the furnace. A large rolling mill, melting yellow brass containing 60% copper and 40% zinc in a 2000-lb. furnace is able to make 500 consecutive heats with an average energy consumption of 224 kw-hrs. per ton. The net metallic loss averages a little less than 1%. While this record is a good one as to time required per melt and as to the number of consecutive heats, it is quite common to melt yellow brass, in furnaces of 2000-lb. capacity, with an average time per melt of 40 minutes without injuring the metal or exceeding the above metallic loss.

The following data apply to 1000-lb. Detroit furnaces and were taken over a period varying from 5½ to 7 working days, the number of heats being in the neighborhood of 35. In other words, the results are actual working results as contrasted to test results. They are typical of what is to be expected under daily foundry operation.

	Cu.	Sn.	Pb.	Zn.
Alloy melted	73	4	5	18
Total metal melted in 7 working days, lbs.				74,000
Number of heats				37
Average heat, lbs.				2,000
Total working time, hrs.				66.67
Heats per 9-hr. day				5
Average kw-hrs. per ton				299
Average electrode consumption per ton, lbs.				3.2
Average melting time, per ton				1 hr. 13 min.
Gross shrinkage, %				2.5
Non-metallic in charge, %				1.6
Net metal loss, %				0.9
Average charge—				
Chips (some clean, some dirty)				55
Gates and scrap, %				39
Pb. and cu., %				6

	Cu.	Zn.
Alloy melted	60	40
Total Melted in 5½ working days, lbs.		68,000
Number of heats		34
Average heat, lbs.		2,000
Heats per 9-hr. day		6
Average kw-hrs. per ton		262
Average melting time per ton, minutes		57
Net metal loss, %		0.90
Nature of charge—		
Scrap, %		50
New metal, %		50

	Cu.	Sn.	Pb.	Zn.
Alloy melted	85	5	5	5
Total metal melted in 5½ working days, lbs.				68,401
Number of heats				35
Average heat, lbs.				1,954
Total working time, hrs.				59.67
Heats per 9-hr. day				6
Average kw-hrs. per ton				280
Average electrode consumption per ton, lbs.				3.47
Average melting time per ton				1 hr. 1 min.
Gross metal loss, %				0.44
Average pouring temperature, deg. F.				2084

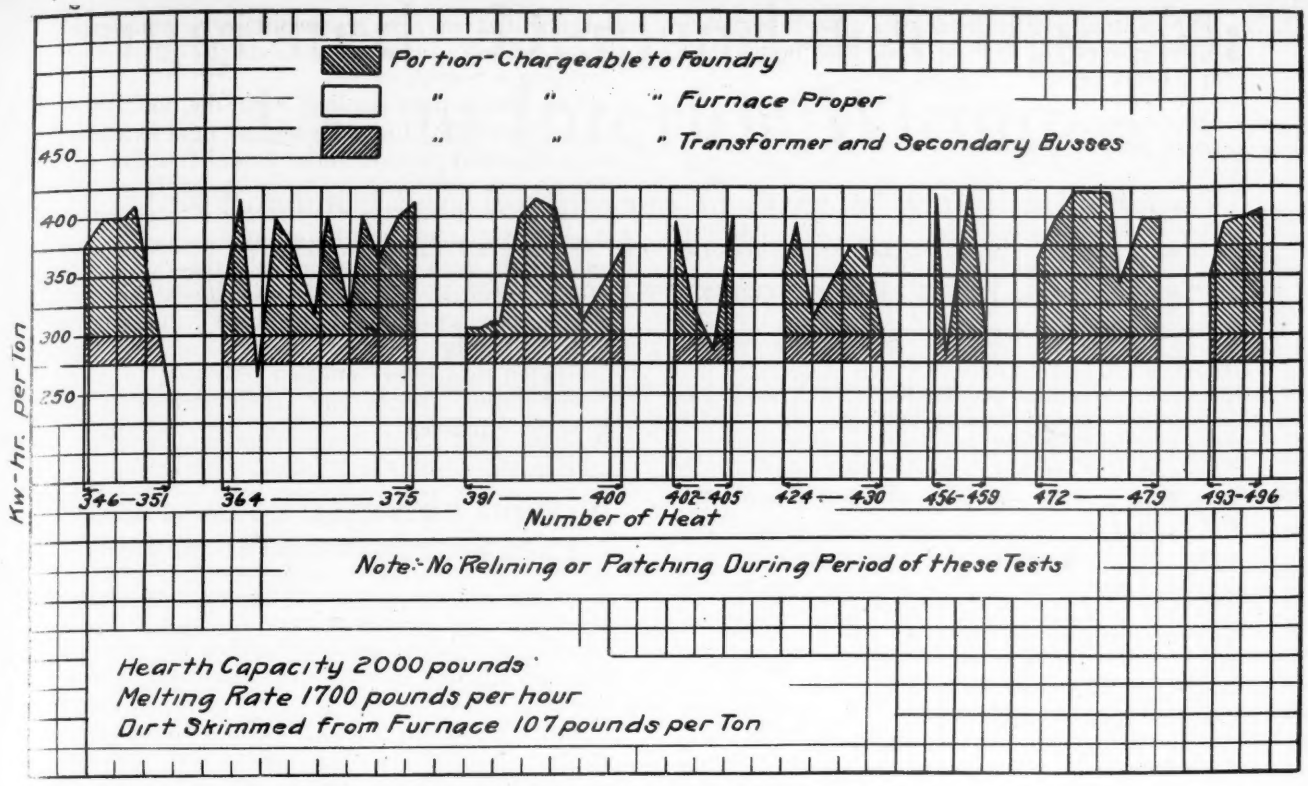


Fig. 2.—Results Obtainable When Producing Red Brass from Dirty Scrap Metal.

Average charge.	Per cent.		
Copper ingot	29.1	New lead	3.4
Brass ingot	4.4	New zinc	0.1
Foundry scrap	38.2	New tin	0.9
Borings	21.0	Total	100.1

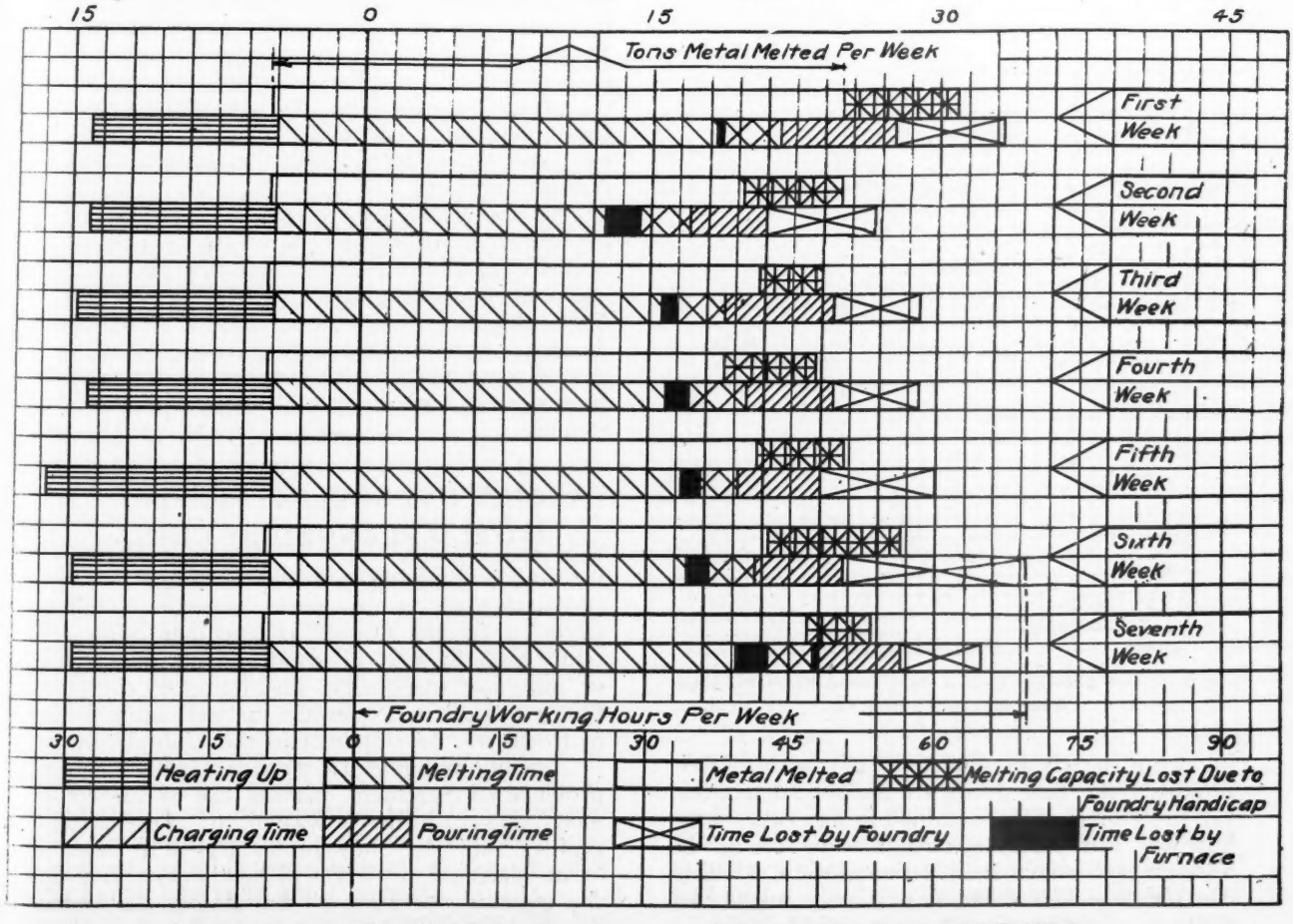


Fig. 3.—Chart Showing Continuity of Service of Furnace in a Commercial Foundry.

The melting performance of a 2000-lb. furnace extending over 5½ days of 8 working hours each and 6 heats per day, is given below.

Alloy melted—	
Copper, %	60
Lead, %	2.5
Zinc, %	37.5
Nature of charge—	
Heavy scrap, lbs.	1,000
Light scrap, lbs.	900
Total, lbs.	1,900
Tonnage melted in 5½ working days, lbs.	66,500
Working day, hrs.	8
Heats per day	6
Electrode consumption per ton, lbs.	2.4
Average melting time per heat, min.	43½
Average kw-hrs. per ton.	206
Gross shrinkage, %	1

A foundry operating four 2000-lb. furnaces for melting an alloy containing 60% copper and 40% zinc kept careful data as to the performance of these furnaces. The total tonnage melted was 500 tons and the average energy consumption per ton was 224 kw-hrs.

	Cu.	Zn.	
Alloy melted, %	60	40	
Tonnage melted, tons			500
Average melting time per ton, min.			51½
Average kw-hrs. per ton			224
Average net metal loss, %			1.02
Nature of charge—			
New copper, lbs.			600
New zinc, lbs.			400
Mixed heavy scrap and briquetted borings, lbs.			1,000

Any type of furnace and any medium for producing heat must be reliable if it is to be commercially successful. If electric brass melting were the cheapest method of melting; if it produced the best grade of metal and a metal far superior to metal obtained in any other way, but was unreliable, electric melting would be handicapped enormously. Fortunately, melting electrically is as reliable as any other manner of melting; oftentimes much more reliable.

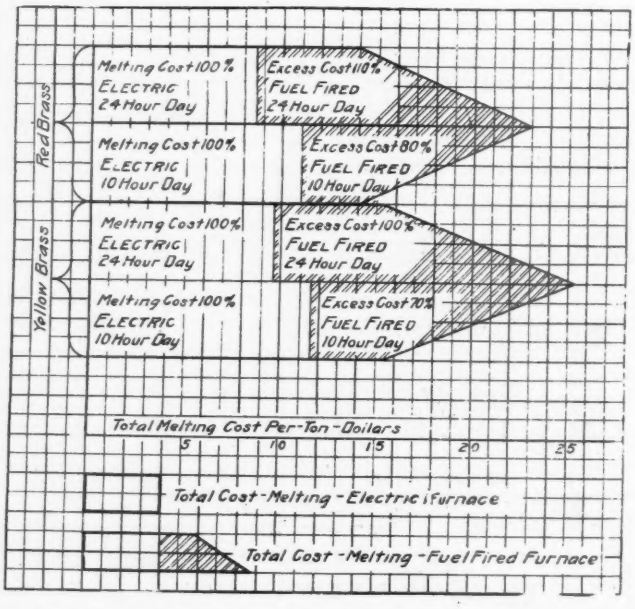


Fig. 4.—Chart Showing Excess Cast of Oil-Fired Furnaces Over Electric Furnaces.

The diagram in Fig. 3 shows the continuity of service that may be expected in a commercial brass-melting furnace, the chart referred to covering a 7-week period.

The above data dealing with the melting of brass electrically, the analyses and data extending over extended periods under actual foundry conditions, are published by courtesy of H. M. St. John, Detroit Electric Furnace Co.; the charts showing reliability of the electric furnace, melting results with dirty scrap and the excess cost of the oil-fired furnace as compared with the electric furnaces, have been taken from a paper by E. F. Collins, General Electric Co., and were presented in a paper entitled "Melting of Some Non-Ferrous Metals and Their Alloys in the Electric Furnace."

ILLINOIS UNIVERSITY PLANS SHORT CERAMIC ENGINEERING COURSE.

At first glance there would seem to be little of interest to the electrical trade in the fact that a number of colleges and universities are announcing special and short courses in ceramic engineering.

But when it is realized that it is through these courses that further development and perfection of porcelain articles used in electrical work will come, the announcements do become of interest. Porcelain now used for knobs, cleats and insulators of all sorts has ofttimes proved faulty and disappointing.

The University of Illinois is the latest to announce a short course in ceramic engineering, this course to open on March 1 and continue to March 13. The course is designed to meet the requirements of practical men and will deal with the principles underlying the work of managers, superintendents, foremen, burners and others who may be concerned with the manufacture of ceramic products.

The two weeks' course is in 24 divisions, embracing all branches of ceramic engineering, and with four additional elective courses, clay analysis, pottery bodies, glazes and drafting and reading of drawings that may be taken if the student desires. Persons desiring to take the course should communicate with Department of Ceramic Engineering, University of Illinois, Urbana, Ill., at once.

LARGEST HYDROELECTRIC PLANT IN WORLD PLANNED BY CHINA.

China is planning to build the largest hydroelectrical plant in the world, according to Jen Chow, a former Cornell college man, who recently came back to this country from the Orient to purchase machinery and supplies for the Chengtu Light & Power Co., as well as to study hydroelectric development in the United States.

"The big hydroelectric plant will be built in the province of Szechuan, making use of the enormous power, hitherto wasted, of the Yangste rapids," said Mr. Chow on his arrival at Seattle. "Our electrical project will be the first step in the gigantic operation of harnessing the water power in the Upper Yangste, whose potential power is far in excess of that of Niagara Falls."

Suggested Demand-Factors for Use in Interior Wiring

How Economy Can Be Effected in Sizes of Mains in Certain Cases When Demand-Factor Is Known — Report of Demand-Factor Committee of Western Association of Electrical Inspectors

By VICTOR H. TOUSLEY
Chief Electrical Inspector, City of Chicago.

Several previous reports have been made to the association covering this subject, but nothing of a definite or workable nature has been presented. At the last annual meeting the matter was disposed of by broadening out and subdividing the committee. However, conditions due to the war and also changes in the personnel of the committee have held back any concerted action. This report, therefore, rather than being the recommendation of the committee assigned to the work, is in the nature of a report of the results of the work of the bureau which your chairman pro-tem represents.

There is some question as to whether an association of inspectors should attempt the problem of the solution of the demand-factor. We, as inspectors, are not primarily concerned in the matters involved. We have for years been requiring a demand-factor of 100%. There is no reason from a fire standpoint why we, as inspectors, should not continue to require in all cases wiring capacity for the full connected load, or at least continue to follow this course until those directly interested, such as contractors, lighting companies, architects, engineers and others who represent the general public, should submit to us some concrete proposition to reduce such requirements. However, in our positions we are not only inspectors, we are also engineers, and as such do, or should, to a great extent, represent the interests of the general public who in reality pay us our salaries. It would appear to your committee that while we are possibly overstepping our past precedents the end will at least justify the means and the work should therefore be carried on.

It cannot be expected that a task as great as that of solving the demand-factor shall be completed at this or any future meeting of this association. The problem is very big. It subdivides itself into several classes, any one of which is a study in itself.

It is realized, however, that the task is much easier of accomplishment if something of a definite nature can be presented as a starting point, even if it is recognized that the starting point is in itself far from being exactly correct.

For this reason your committee desires to present in this report a definite starting point, and the report is presented with the hope that the errors or wrong conclusions will be discovered and intelligently discussed to the end that they may be finally made correct.

It is also the hope of the committee that the members of the association will, during the coming year, apply the information herein given. In so doing they will not only become intimately conversant with the subject, but will so interest themselves as to do their share of the work necessary to bring it to a final conclusion.

To What Shall Demand-Factor Be Applied?

One of the first questions arising in connection with the application of the demand-factor is that of, to what it shall be applied? This question may be answered by the statement that it can be applied to any or all of those parts of the wiring with which we, as inspectors, are concerned; in other words, the interior wiring. It may be, and is a fact, that in many places the demand-factor will be 100%. However, all parts of the installation should be considered.

It will be found that in nearly all cases a demand-factor allowance may be applied to mains feeding a number of pieces of apparatus or a number of tenants. In many cases it may be applied to submains. In some cases it may be applied to the branch or final circuit.

Mains are usually of short length, but they are also generally of large capacity. A reduction in the size of copper means often a considerable saving in the cost of wires or cables, cost of conduits and cabinets, cost of switches and also in the cost of labor to install. As the diversity-factor has its greatest effect in the case of mains, it is logical that we should first consider this part of the installation.

The argument for saving in the cost also applies to submains, but as these are smaller in size and, as the diversity-factor is of less effect, the consideration of demand-factor is of less importance.

In the case of branch circuits the saving is, generally, much less and the diversity-factor is almost entirely eliminated. However, where the branch circuit supplies current to a motor other considerations enter which may well be taken into account.

In order to submit something definite for consideration, and for the purpose of obtaining experience, the committee desires to recommend the following demand-factors for the various classes of service shown. It may be well to repeat here that these values are not considered as final or accurate. However, they represent the result of several years' study covering a number of cases. A starting point must be made and so far as your chairman knows there is no authentic information on the subject. It is up to this association and the individual members

to develop this table both completely and accurately.

TABLE I.

Classification.	Demand-Factor.
Apartment houses	Each apartment to be wired on a basis of ¾ watt per sq. ft. Mains as follows:
	No. of Ap't's — D-F.
	1 to 5 — 100%
	6 to 10 — 95%
	11 to 15 — 90%
	16 to 25 — 85%
	26 to 35 — 80%
	Above 35 — 75%
Clothing manufacturers	100%
Cranes	60%
Department stores	75%
Elevators, passenger	70%
Foundries	75%
Garages, public	100%
Hospitals	75%
Hotels	75%
Machine shops, jobbing	75%
Manufacturers, general	75%
Office buildings	80%
Packing houses	80%
Printing	80%
Tanneries	75%
Theaters	Mains should have a carrying capacity equal to auditorium lobby, sign and dressing room lights for 1 hour, and in addition stage capacity for 30 minutes.

All the demand-factors given apply to mixed loads, or loads including both lights and motors.

Special attention is called to the demand-factor for apartment buildings. This is probably one of the most common applications and yet one of the most difficult. It is well known that all the lights in an apartment are not usually on at one time. Only at infrequent occasions are all lights used at once, as in the case of a party, for instance. The probability of all tenants having a party on the same night is possible but very remote. In any group of apartments some tenants are likely to be away for the evening and no lights used. Those that are using lights vary in the hours in which they are used and it is unlikely that the maximum loads will all occur at the same time. All of these factors tend toward the allowance of a small demand-factor. However, we cannot overlook the ever-increasing use of heating devices. Many of these are used at the time of peak load, such as percolators, grills, etc., and one such device may exceed in its current requirements the entire lighting load. For this reason the demand-factor in the table has been greatly restricted, over what might be allowed if it was not necessary to take into consideration the heating devices.

In all cases a conservative demand-factor has been recommended. In the case of cranes, for instance, a number of cases were investigated. The minimum demand-factor was found to be 17%, the maximum 54%. This latter was obtained in a coaling crane where the apparatus was in constant and continuous use. The demand-factor recommended for this class is 60%.

It is often possible to permit a demand-factor allowance on the final or branch circuit where such circuit feeds a motor whose load is of an intermittent character. The carrying capacity of a wire as given by the Code is based on the assumption that such wire will carry its rated current indefinitely and in so doing will never exceed a certain temperature rise. The heat generated in a wire is proportional to the square of the current and the ultimate temperature depends on the length of time such current continues to flow through the wire. Where the current is "on" and "off," the wire is heated during the "on" period and cooled during the "off" period. Its final temperature will depend on these two factors. It is obvious that a wire may, with intermittent load, carry a current much greater than its rated capacity. Illustrations of loads of the nature above referred to are: elevators, cranes, spot welders, etc.

A number of experiments were made by the Commonwealth Edison Co., of Chicago, at the request of the department which I represent, to determine the heating effects of currents upon wires of various sizes. Unfortunately, it is impossible to give in this report the complete result of these tests. However, the following table will show some of these results.

The department is using the information so obtained in applying the demand-factor to the class of intermittent loads described above. It is impossible at the present time to give any definite or easily understood rules covering this phase of the question. It is hoped, however, that these will follow in due time.

In concluding this report it is the desire of the

TABLE II.—WIRES IN CONDUIT.

Table of carrying capacities; three conductors in conduit, each carrying same current.
Twenty degrees C.; 36 degrees F. temperature rise above surrounding air.
Use this table for rubber-covered wires in conduit where temperature of air does not exceed 85 deg. F., and for other insulations at temperatures from 85 deg. F. to 125 deg. F.

B. & S. gage	Size conduit, inches	Nat'l Elect'l Code — Carrying capacity amperes	Nat'l Elect'l Code — Temperat. rise in deg. F.	Calculated carrying capacities 36° F. rise — Indefinite time, amperes	Short time in minutes — 30	15	10	5
14	½	15	27.0	17	19	22	24	30
12	¾	20	31.0	22	24	26	29	35
10	¾	25	27.9	27	30	35	40	45
8	1	35	29.9	36	43	50	60	65
6	1	50	33.1	52	60	73	80	105
5	...	55	....	56	69	88	100	125
4	1¼	70	40.7	64	77	97	110	140
3	1¼	80	34.9	82	93	113	135	165
2	1½	90	34.7	90	106	130	155	195
1	1½	100	39.1	96	126	154	180	225
0	2	125	41.2	110	147	182	210	275
2/0	2	150	41.8	130	179	220	260	340
3/0	2	175	39.4	150	213	270	320	420
200,000	...	200	....	175	247	310	355	480
4/0	2½	225	57.6	180	256	325	395	515
250,000	...	240	....	205	297	375	455	585
300,000	3	275	45.2	238	345	435	535	690
350,000	...	300	....	265	395	500	605	790
400,000	3	325	42.1	290	440	555	690	850
500,000	3	400	48.1	345	529	660	800	1,090
600,000	...	450	....	390	610	750	915	1,225
700,000	...	500	....	430	680	830	1,025	1,400
750,000	4	525	44.8	450	710	870	1,080	1,450
800,000	...	550	....	465	745	905	1,120	1,525
900,000	...	600	....	495	810	975	1,210	1,665
1,000,000	4½	650	55.2	525	870	1,040	1,295	1,800

committee that the subject matter be given careful consideration and application during the coming year and that all information obtained be submitted to the committee for study. It should also be noted that information to be of value must be complete in every detail. The information should contain the following:

1. Method of obtaining the maximum load: Whether by direct ammeter readings, maximum demand as shown by demand meters or printometers or other means. It is important to know whether instrument readings show true current value or simply the wattage of the current.

2. Were readings taken at time of maximum yearly load?

3. Method of obtaining connected load. Whether by actual count of apparatus or by estimating on the basis of a certain wattage lamp for each socket.

4. In the case of motor loads, state the exact kind of business carried on (this is necessary for proper classification); also state how the load is used. As an illustration of this latter is the case of woodworking plants. In many of these shops, although there are a number of machines, the work in hand follows a regular course and is carried from one machine to another. In this case many machines are idle and the demand will be low. On the other hand, some woodworking shops (manufacturing shops) keep a man at each machine and run the machine almost constantly. In this case the maximum demand will be higher.

5. State the voltage and whether direct current or alternating current. On a-c. systems the power-factor sometimes becomes of considerable importance.

6. Character of load, whether all lights or all power. If the load is mixed (light and power), give approximate proportion of light and power. Demand-factors will generally be found smaller on power loads. If power is used, state the purpose for which used; elevators, cranes, etc., or for general purposes. If load consists of lights only, give, if possible, the watts per square foot; in other words, the total wattage divided by the total square feet of floor space illuminated. It may ultimately be found advisable to use this as the basis of demand-factor for lighting.

Complete information should be obtained, but any information may be of value.

In order to verify both the information herein given or to satisfy yourself that a certain demand-factor which you may allow is safe the following arrangement may be made. The granting of a demand-factor is optional with the inspector. As the granting of a demand-factor will result in the saving of money for the contractor or owner, it is often possible to arrange with them for the installation of suitable instruments with which the actual maximum may be accurately obtained. This practice is being followed in our own department and we find that contractors are glad to co-operate in this very desirable investigation.

The committee recommends careful thought in applying the factors submitted. Each case should be studied by itself and the several features which distinctly affect the demand factor should be carefully considered. On a-c. systems the power-factor of the load may be so low as to entirely overcome any allowance which may be deemed advisable on account of the character of the load. The question of future demands on the system must be taken into account; in many cases considerable additional apparatus is connected after the wiring system is complete. The reinforcement of mains is a very expensive proposition while an increase in capacity at time of installation may be made at slight additional cost.

The committee also suggests that the table given in the report be submitted to contractors' associations and lighting companies for discussion and suggestions.

ELECTRICITY IS BIG AID IN WORKING OUT U. S. CENSUS FIGURES.

Machines Enable Office Work to Be Done in Weeks Instead of Years.

Electrically operated machines will make it possible for the United States Census Bureau to make public the figures of the 1920 decennial census within a few weeks after the enumerators have finished their work instead of many months, and in some instances, years, after the end of the enumerators' work, as in the past.

Collecting the information is but the introductory part of the census. There remains the vital work of accurately compiling about 110,000,000 schedules and condensing them for publication. It is here that the mechanical powers of electricity come to the rescue, says the *Scientific American.*

The card-sorting and the card-tabulating machinery of the census is simple, highly perfected, and splendidly efficient. In operating, the symbols for each are inserted by editors over the items in the various columns of the schedules to form divisions. The facts relating to sex, age, race, birthplace and other subjects of inquiry are indicated on individual cards by punching holes through the symbols corresponding to those on the schedules.

Something like four million cards can be punched in a day by the army of clerks with the electrically operated punching machine. The punched cards are automatically fed to the tabulating machines. Wherever there is a punch in a card an electrical connection is established by a blunt needle passing through the hole into a cup of mercury and the fact is registered. On the machines first used there was a series of dials from which the figures were copied off on "result slips" and filed for the compiling clerks. With the later machines this operation is entirely cut out.

They are equipped with an automatic attachment for printing the totals (for each unit of area, district township, ward, city, county or state) and operate at the approximate rate of 24,000 cards an hour.

It will require about 110,000,000 cards to record the population—a stack over ten miles high. As each of these cards is passed through the tabulating machines six times, more than half a billion electrical connections are made in tabulating the population of 1920.

Survey of Prevailing Conditions as to Industrial Lighting—III.

Analysis of Last Lighting Changes and Control of Lighting Betterment—Interest in Lighting and Knowledge of Progress in This Art—Other Interesting Facts Disclosed in the Survey

In order to secure the maximum benefits from a factory lighting system, that system must be kept up to date. That is, it must not only be maintained to a high standard of cleanliness of lamps and reflectors, and prompt renewal of burned out or broken lamps and glassware, but the entire equipment must be rehabilitated from time to time so as to take advantage of increased efficiency and effectiveness made possible by the steady progress of the lighting art. Lighting

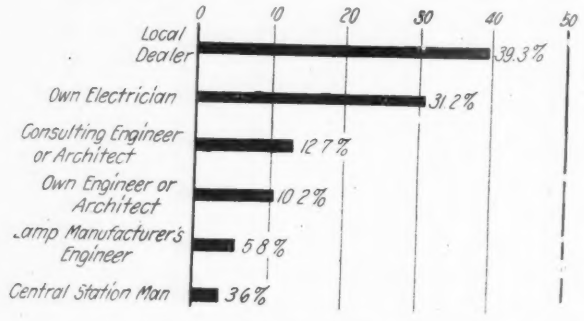


Fig. 9.—History of Last Lighting Change—By Whom Planned or Laid Out.

experts are practically agreed that five years should, on the average, be the greatest interval between such rehabilitations of the lighting equipment and sometimes also of the lighting system as a whole.

For this reason, as we have seen in Part II of the report on the lighting survey made for the National Lamp Works last year, a great deal of attention was given to noting when the last lighting changes had been made; in other words, how up-to-date the lighting actually was. Equally interesting was the study of how and by whom the last lighting changes were effected, as this clearly shows the tendency in making similar changes in the future.

History of Last Lighting Change.

Some 300 reported wholly or partially upon this feature. With 60% of these the last lighting change was in the nature of a change in lighting equipment or lamps; with 31% it was a change in the lighting system, and in 8% of the instances it was a case of lighting new buildings or additions. The local dealer was the principal factor in planning or laying out such changes, having acted in this capacity in 39% of the instances, while in 31% the companies' own electricians had planned the change. The next most important factor was the consulting engineer or architect.

The strength of the local dealer as a factor in planning or laying out such changes was considerably greater in territorial zone D than in any of the others and was weakest in zone C; the range being from 48 to 30%. Lamp manufacturers' engineers were most active in zone B. From the standpoint of size of concerns, the local dealer is found to be twice as important a factor in the smaller concerns as he is in the larger, and the consulting engineer or architect a little more than twice as important a factor with the larger concerns as with the smaller. From the standpoint of lighting requirements, the lamp manufacturers' engineer is found to have little to do with installations involving rough work, and the most to do with those where very fine work is carried on. The local dealer's influence diminishes somewhat as the lighting requirements become more severe, as witness the fact that he is found to plan 64.5% of the installations in class of rough work and only 17.5% in class where fine work is done, while, on the other hand, the consulting engineer or architect grows in importance as the lighting requirements become the more severe, the percentages ranging from 3% for rough to 17.5% for fine work.

Coming to the actual installation of the change or improvement, the local contractor or dealer effected the installation in about 56% of the cases, while the company's own electrician did

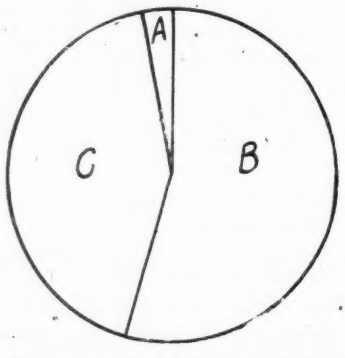


Fig. 10.—History of Last Lighting Change—By Whom Installed.

	Per cent.
A. By central station	2.0
B. By local contractor	55.8
C. By own electrician	42.2

the work in 42%, leaving 2% of the cases to the central station.

With regard to the kind of lamps employed, in about 70% of the cases vacuum incandescent lamps were used; in 53% gas-filled lamps were employed, and in 3% vapor lamps. There were no installations of arc lamps reported. The above proportions indicate a considerable overlapping of vacuum and gas-filled incandescent

lamps, or a fair proportion of instances in which both were employed.

The kind of system installed was mainly of the general overhead type (58%), while in about one-quarter of the instances mixed overhead and local lighting was employed, and in one-sixth of the instances local units.

In more than 90% of the cases reported upon the consumers were well satisfied with the results obtained. Six per cent were dissatisfied, while a little more than one-third considered the installation as only fairly efficient. This is the reflection of the opinions of the persons interviewed with regard to the efficiency of the system installed. The investigators' expressions tell an entirely different story, for they find 21% of these installations unsatisfactory, only a little more than one-quarter very efficient, and upwards of 50% only fairly efficient.

These lighting installations received considerable attention from the management in nearly 53% of the instances. They receive some attention from the management in an additional 30%, while they received very little or no attention from the management in about 18% of the cases. With respect to the attention given the installation by superintendent or electrician, however, it was found that close attention had been given in somewhat more than three-quarters of the cases, considerable attention in one-sixth of the cases, and little or no attention in only about 7%.

Definite results accomplished were reported in 262 instances. While the question asked for *definite* results, some of the answers were quite *indefinite* as, for example, the answer that the installation "met the exact needs of the business," reported by 22% of this group, or that it "gave them the satisfaction of having improved the lighting," reported by about 16%, whereas 61% reported "better light" and 21% "more light." Sixteen per cent reported a "greater efficiency, better working conditions, etc." Somewhat more definite answers were obtained on the part of 11%, who reported "decreased cost," by 17.5% who reported a "decreased number of

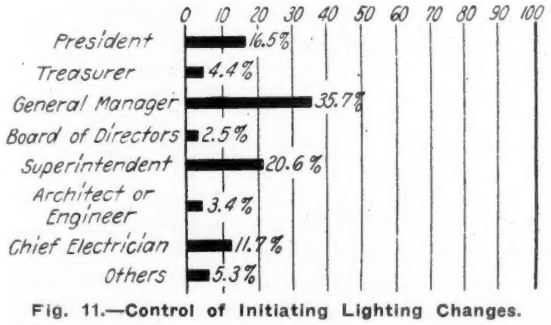


Fig. 11.—Control of Initiating Lighting Changes.

units," and 9.5% who stated that the installation "had eliminated the nuisance of arc lights."

Two-thirds of the industrial concerns reported upon stated that the summer season is the best time of year for such changes. A little more than one-sixth prefer autumn, one-eighth spring and about 3% only prefer the winter.

Control of Lighting Proposition Within the Establishment.

A number of very definite questions were asked to secure a clear-cut analysis as to where the control of the lighting proposition is lodged in the average instance. With respect to the initiation of lighting changes or improvements it is found that the most important factor is the general manager of the business, or the president, who is given the authority for the initiation of lighting changes in 36 and 17% of the instances, respectively. The superintendent is the next most important factor, followed by the chief electrician. As the size of the business increases, the superintendent and chief electrician

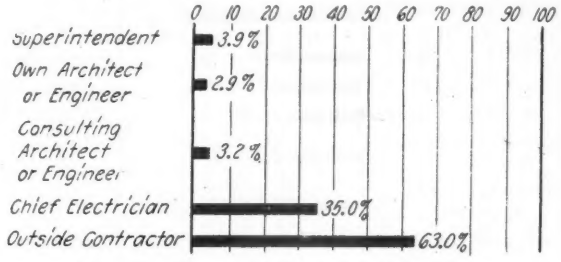


Fig. 12.—Responsibility for Installation.

are found to become more important factors, although the general manager still leads. Fig. 11 gives the details.

When it comes to the purchase of equipment or letting of contracts, in a great majority of the cases the men who have to be convinced are the general manager and president. The purchasing agent comes third. The superintendent of the plant is the next most important person in this respect, and the treasurer fifth.

Actual installation is delegated to outside contractors in about 63% of the cases, and is handled by the chief electrician, superintendent or engineer in the remainder. With the larger concerns, the company's own electrician handles about 55% more of the volume of installations than outside contractors, while with the smaller concerns, outside contractors handle the installation three times as often as the company's own engineer, electrician, superintendent, etc. The smaller the town the more of the business there that is handled by the outside contractor. Fig. 12 gives the average of all replies as to responsibility for installation.

Some 44% of the plants covered had chief electricians, two-thirds of whom were ranked by the investigators as being very capable, while an additional 30% were ranked as fairly capable. In one-third of the instances in which chief electricians are employed, electrical matters are completely delegated to them. In an additional 53% of establishments they are very largely delegated to them.

With regard to consultation respecting lighting changes, additions or improvements, the electrical retailer is found to be the most important factor, the electrical jobber second, consulting architect or engineer third, and central stations fourth. This is shown in Fig. 13.

Attitude Toward Industrial Lighting Proposition.

The reaction on the part of the individuals interviewed with regard to the industrial lighting proposition was especially encouraging. Answering the question as to how important they considered artificial lighting in their business, more

than 55% of the individuals interviewed expressed themselves as considering it vitally important, while an additional 32% considered it moderately important. Only 13% would confess that they viewed it as of little importance.

Dividing the group into classes with regard to their respective lighting requirements, an interesting and constant curve of increased interest and respect for the lighting proposition is shown as the lighting requirements increase or become more exacting.

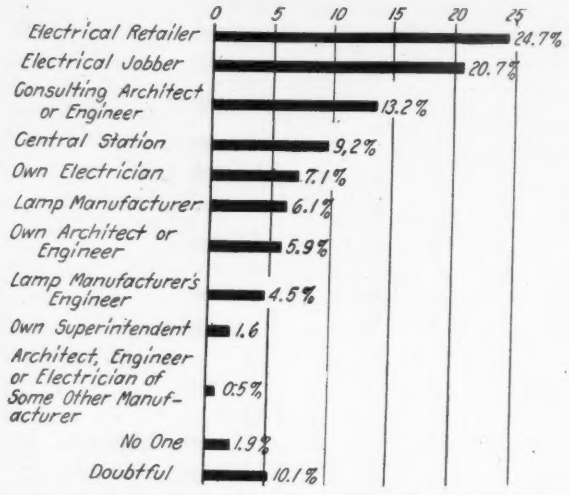


Fig. 13.—From Whom Consumer Would Seek Advice Regarding Lighting Changes.

On the point of their interest in the industrial lighting subject, 38% were given as being actively interested, and 35% were given as moderately interested, a total of 73%. An additional 17% were passively interested, while only about 9% were given as being disinterested. This active interest was found to be much greater in territorial Zones B and C than in the others, while a considerably greater proportion were passively interested, or entirely disinterested in Zone D (the South) than in any of the others. The interest was much greater on the part of the older concerns than the younger, exactly twice as great a proportion being given as actively interested in the older group than in the younger.

In answer to the question as to whether the party interviewed was disposed to buy lighting or merely lamps and equipment, a question which incidentally was asked *of* rather than *by* the investigator, and the answer to which was directed by the trend of the entire interview rather than the response to a single question, virtually three-quarters of the group were listed as being disposed to buy lighting rather than merely lamps or equipment.

This disposition is further exemplified by the answers to the question as to whether the party would give the same amount of attention to a lighting problem as to a power problem, or to the purchase of lighting equipment as to the purchase of motors, generators, or electrically driven machinery. Fig. 16 gives a distribution of all the replies. The disposition to give considerably more attention to lighting than to power problems is far more pronounced in the larger concerns than in the smaller ones. Four times as great a proportion in the smaller group would give considerably less attention to lighting than to power.

A somewhat greater tendency to give more attention to lighting than to power is found as the lighting requirements increase, but the differentiation on the cross analyses is not as great as might be expected, for even with the low-requirement group nearly 50% would give as much or more attention to lighting as power, while with the highest-requirement group this percentage would only increase to 71%.

When asked whether an improvement in lighting would be considered an expense or an investment, a little more than one-quarer of the group viewed it as an expense, the remainder as an investment. Of those who stated that they would consider it as an investment, 278 gave their reasons, the most significant of which was "increased production," named by 47%. Next was "decrease in spoilage" or better work, mentioned by 37%. "Prevention of accidents" was third, given by 19%, these three being by far the dominating reasons expressed. The complete analysis is shown in Fig. 17.

Familiarity with Different Styles of Lamp.

Nearly 90% were found to be familiar with Mazda B lamps, a little over 60 with Mazda C,.

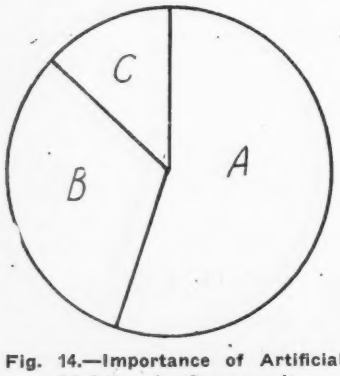


Fig. 14.—Importance of Artificial Lighting in Consumer's Business.

A—Considered as vitally important, 55.4%.
B—Moderately important, 31.6%.
C—Of little importance, 13.0%.

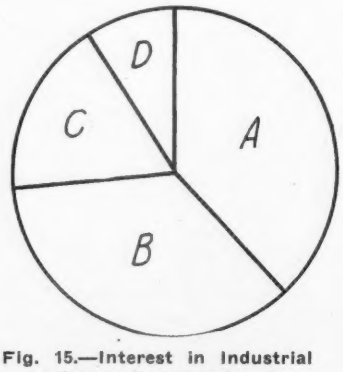


Fig. 15.—Interest in Industrial Lighting—Average for the Whole Group.

A—Actively interested, 38.0%.
B—Moderately interested, 35 2%.
C—Passively interested, 17.2%.
D—Disinterested, 8.7%.

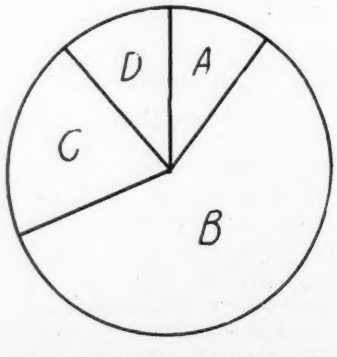


Fig. 16.—Comparative Attention Given to Lighting and Power Problems—Whole Group.

A—More attention given to lighting, 10.4%.
B—As much attention to lighting, 57.8%.
C—Somewhat less attention to lighting, 20.2%.
D—Considerably less attention to lighting, 11.5%.

and 15% with Mazda C 2. The greatest degree of familiarity with Mazda C lamps was in territorial Zone D, the smallest in Zone A. There is a constant decrease in familiarity with Mazda B lamps as the size of the town decreases, the range of percentage for the three groups on population basis being from 71.5 to 47.4. Familiarity with the Mazda C lamp increases quite materially as the exactions of lighting require-

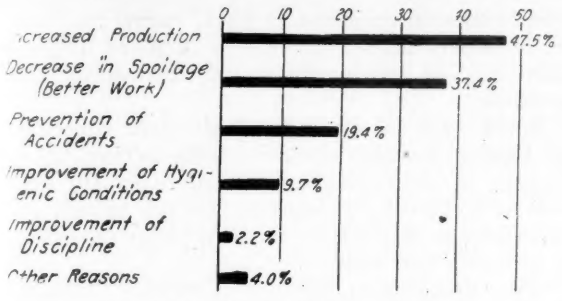


Fig. 17.—Why Lighting Improvements Would Be Considered an Investment.

ments increase. Mazda C 2 lamps are known the best in territorial Zone C, and are least known in Zone A, apparently. They are not nearly so well known in the small towns as in the larger towns. These also are much better known as the exactions of the lighting requirements increase, and a much more abrupt increase in familiarity with this type is shown than is the case with Mazda C, the range of percentages being from 6.7% for the low-requirement group to 30.4% for the high-requirement group.

Intelligently Informed as to Efficient Lighting.

At this stage of the interview the investigators were required to answer the question as to whether the party interviewed was intelligently informed as to what efficient industrial lighting really was. The investigators, it is to be remembered, were very clearly instructed themselves as to what actually constituted good industrial lighting and were accordingly quite well qualified to answer this general question.

Of the entire group, as shown by Fig, 18, 44.5% were ranked by the investigators as being intelligently informed in this respect, an additional 36% as vaguely informed, while 20% were given as being uninformed. Cross analysis brings out the fact that the intelligence on this subject is much greater in territorial Zone C than in any of the others, and is lowest in Zone D; that education on this feature is much more pronounced in the larger towns, and that the smaller the town the smaller the degree of intelligence on this point also; that the individuals interviewed in large establishments were more than three times as well informed as those in the smaller establishments.

Appraising the Advantages of Good Lighting.

The advantages to be derived from efficient factory lighting range in importance, according to the opinions of consumers, as shown in Fig. 19. Roughly, the value of these factors, according to the consumers, may be set down as follows: Increase in production, 8 points; decrease in spoilage, 7 points; prevention of accidents, 6 points; improvement of discipline, 5 points; improvement of hygienic conditions, 4 points.

In theory, at least, selling or advertising arguments along these lines should have the relative effect indicated by this rating.

The relative importance of these factors does not change very much when the consumers are divided into two groups according to size of establishment, but the recognition of each of these five factors is considerably greater in the class of larger establishments.

The survey brings out clearly the fact that the National Lamp Works as an institution, and particularly its research and development work, has not been sold to the industrial consumer as thoroughly as it might well be. Only 5.5% of the group were familiar with this work, and only an additional 13% vaguely familiar with it, while over 80% had never heard of it.

More than one-quarter of the individuals called upon were conscious of having read articles in magazines and trade papers bearing upon the industrial lighting subject.

With regard to cultivation by lighting solicitors or lamp salesmen, it is found that approximately 5% are frequently called upon, an additional 25% occasionally called upon, or that a little less than 30% are visited frequently or occasionally, while the remaining 70% are called upon seldom or not at all.

Investigators' Observations in Plants.

The investigators went through 175 plants closely and an additional 136 to a sufficient extent to make observations with regard to lighting equipment. The condition of present lighting equipment within these plants was appraised by the investigators as follows:

In offices, 19% excellent, 36% good, 31% fair, 13% poor.

In workshops, 9% excellent, 32% good, 29% fair, and a total of 30% rated as poor, very poor or partly good and partly poor. (See Fig 20.)

This indicated clearly that the offices are much

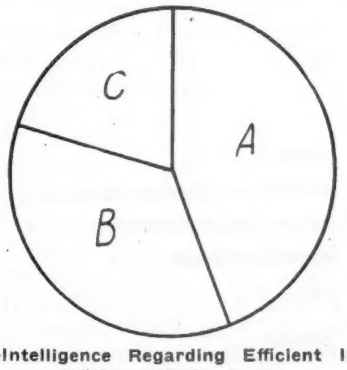


Fig. 13.—Intelligence Regarding Efficient Industrial Lighting—Whole Group.

A—Intelligently informed, 44.5%.
B—Vaguely informed, 36.4%.
C—Not informed, 20.1%.

better lighted than the workshops. Since the latter constitute many times as great a floor area, the great opportunities for lighting betterment business in the shop or workrooms are quite apparent.

In 17% of the instances the investigators found many empty sockets, in 48% a few, in

36% none. Carbon lamps were found by the investigators as follows: in 5.5% of the instances they found many, in 26% a few, in 68% none.

With regard to burned-out lamps, there was but one instance in which many were found, but

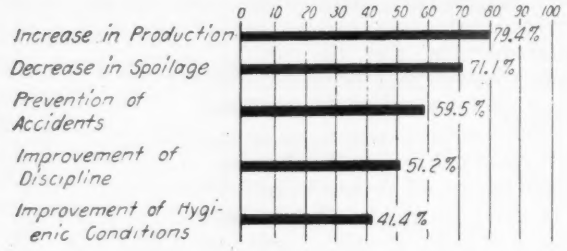


Fig. 19.—Appraisal of Advantages to Be Derived From Efficient Industrial Lighting.

in one-sixth of the cases a few were observed. In about 60% of the cases, the lamps and reflectors were very clean or fairly clean, while the remaining 40% were dirty or very dirty. In about one-sixth of the plants the lamps were entirely equipped with reflectors, in one-third largely so, in the remaining 50% only party or not at all.

Spacing or arrangement of lighting units was reported as efficient in one-sixth of the plants, as fairly good in about 43%, and as inefficient in 40%. Lamps were found to be cleaned regularly or frequently in nearly 30% of the plants, irregularly or infrequently in the remainder.

Proportion of Work Done Under Artificial Light—Other Facts Brought Out in Survey.

As regards the proportion of work done on an average throughout the year under artificial light, the percentages reported ranged from zero to 90. The proportion of work done throughout the year under artificial light, in the average plant, is found to be 17.5%. It is interesting to observe that there is no great difference in this average whether worked out as a weighted or unweighted average. Fig. 21 shows the distribution graphically.

Lighting Costs.—Almost 47% of the concerns keep their light cost separate from power cost. Some 340 concerns reported either actual or

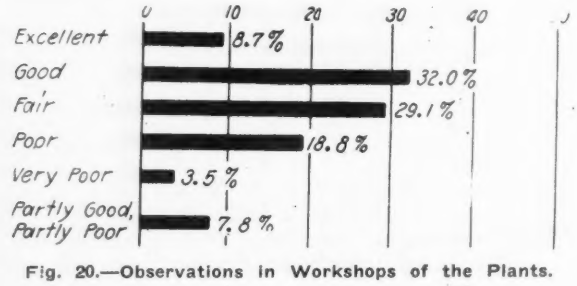


Fig. 20.—Observations in Workshops of the Plants.

approximate costs for summer and for winter lighting. Winter lighting costs were found to be 280% greater than summer lighting costs, the general average of lighting cost for summer being $216 per month, and the winter lighting cost $613 per month. Over 53% of the concerns had their lighting and power lines on separate meters, thus affording a fair basis for figuring lighting and power costs separately, if desired.

Attention Paid to Advertising.—General publications read by the parties interviewed were, in the order of their importance, the weeklies of wide national circulation, followed by monthlies of similar distribution. With regard to technical papers read, owing to the diversity of industries called upon, practically every trade paper of any importance was named by some one or more manufacturers. The high showing made by the electrical papers was due to the proportion of electricians interviewed. These were the only trade papers named by twenty or more individuals out of more than 300 answering this question.

Some 53% of the individuals were conscious of having noticed advertisements pertaining to factory or industrial lighting, in either the general or technical publications. Of this group, 128 attempted to name the company whose advertisements they had seen.

The domination of the *Saturday Evening Post* in its field is shown by the voluntary answer to the question as to in what publication such

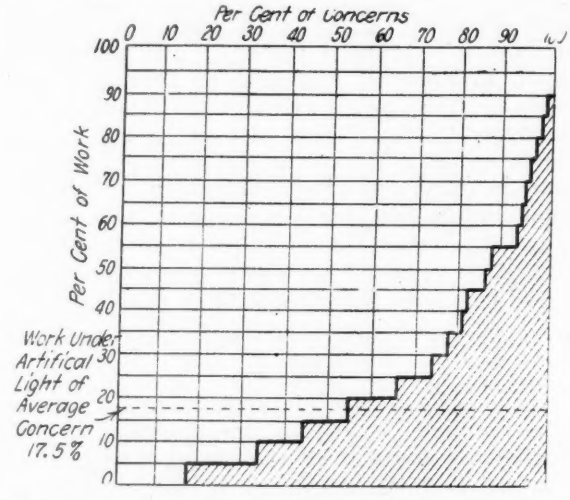


Fig. 21.—Proportion of Work Done Throughout the Year Under Artificial Light.

advertising had been seen, the *Post* being named by 58% of those attempting to give an answer, the next largest score, so far as general magazines were concerned, being made by *System*, with 3.5%. Among technical publications mentioned, the highest was *Factory*, with 11.7%, Electrical Review being given by 8%, *Electrical Record* by 7%, and *Electrical World* by 7%.

Just 11% of those who were conscious of having read such advertising stated that they were actively interested in it, 43% that they were moderately interested, and 30% that they were passively interested, while only 15% claimed that they were not at all interested. One-third of the group stated that they had received definite impressions from such advertising, while 27.5% stated that they had received ideas on lighting from such advertising.

Familiarity with Rapid Development in Industrial Lighting Within Past Five Years.—Answering this question, again one which was asked of the investigator rather than by him, practically 10% of the individuals interviewed were given as being very familiar with the progress that has been made, an additional 40%

fairly familiar with it, and 32% vaguely familiar, making a total of over 80% who were familiar with this progress to some degree. Only 4% were given as entirely unfamiliar. The familiarity with the progress that has been made is found to increase proportionately as the lighting requirements increase, and is found to be greater on the part of the older than on the part of the younger establishments.

Proportion Producing Their Own Light and Power.—About 37% were found to produce their own light and power. Some of these also bought light and power from other sources, a total of 69% being given as purchasing light and power from outside. Only 1% used gas, and 1% steam power direct without electric motors.

Conclusion.—This survey of industrial lighting, as was stated at the beginning, is the most comprehensive ever undertaken in this field. It was conducted by a corps of investigators under the special supervision of R. O. Eastman, of Fuller & Smith, Cleveland, Ohio. The survey was made for the National Lamp Works of General Electric Co., Cleveland. To W. E. Underwood, of the Publicity Department of the National Lamp Works, we are indebted for valuable assistance in preparing our summary of the report.

KANSAS ADOPTS INDUSTRIAL COURT LAW AS LABOR PROBLEM AID.

Workings of New Measure Will Be Watched with Interest by Entire Country.

The Kansas industrial court bill, the most advanced legislation thus far adopted in the United States on the labor problem, was passed by the Senate and House of the Kansas Legislature recently and was at once made an active law of the state by the signature of Governor Allen.

Some of the principal provisions in the law are:

Establishes an industrial court of three judges, appointed by the governor, with three year terms at salaries of $5000 each.

Court supersedes public service commission and is given authority to supervise all public utilities and common carriers in the state for the purpose of "preserving the peace, protecting the public health, preventing industrial strife, disorder and waste, and securing orderly conduct of the business directly affecting the living conditions of the people of the state and in the promotion of the general welfare."

Outside of the utilities the industries covered by the new court are: The manufacture and preparation of food products in any stage of the process from the natural state to a condition to be used as food for human beings; manufacture of clothing and all wearing apparel; mining or production of fuel, either for domestic or manufacturing purposes; transportation of any of the above products.

Under the law it is declared to be necessary for the public peace, health and general welfare that all industries and employment shall be operated with reasonable continuity and efficiency, in order that the people may live in peace and security and be supplied with the necessities of life.

No person, firm, or corporation, or association of persons shall, in any manner or to any extent, wilfully hinder, delay, limit, or suspend such continuous and efficient operation for the purpose of evading the provisions of the law.

In case of any controversy arising between employers and workers in any of the industries named, which threatens to endanger the continuity or efficiency of the service named, jurisdiction is given the court to act upon its own initiative to summon all necessary persons to obtain books and papers to investigate such controversy.

The right of every person to make his own choice of employment and to carry out fair, just and reasonable contracts of employment is recognized by the law. If any such contract is found to be unfair by the court during the pendency of such contract, the court may order it changed or amended.

If either or both parties to a controversy refuse to obey the orders of the court after a finding is made, the state may take over such industries and operate them.

Labor unions may incorporate under the laws of the state, but are not compelled to.

The right of collective bargaining is recognized.

The right to picket industrial plants or to disturb the workers engaged is denied.

It is made unlawful for any person, firm, or corporation to discharge any employe for appearing before the court, either to make complaint before it or to testify in its hearings.

To cease work, or strike, for the purpose of violating the law is made an offense punishable by a fine of $500 or six months in jail, or both. For any officer of any firm, corporation, union, or association to order or to call a strike or foment one, is made a felony, punishable by five years in the penitentiary, or a fine of $1000, or both.

Efforts to test the law from a constitutional standpoint have already been made through a Kansas labor body making a fight on the picketing clause in the law.

Speaking editorially of the Kansas law, the *Chicago Tribune* last Monday said:

"The act creating an industrial court, just passed in Kansas, initiates one of the most significant experiments in our labor legislation. Its results will be watched with great interest throughout the country.

The experiment is radical from the conservative viewpoint, and conservative, not to say reactionary, from the radical viewpoint. It could not have been enacted at this time in any but a state in which the agricultural vote preponderates; but it need not for that reason be dismissed as of restricted possibilities. If it works well it will be adopted in other agricultural states and will in some measure be imitated in other states."

ELECTRICAL JOBBERS' ASSOCIATION TO MEET.

The Atlantic Division of the Electrical Supply Jobbers' Association will hold a meeting on Feb. 9. 1920, at the Hotel Commodore, in New York City.

On the same date the Central Division will meet at the Hotel La Salle in Chicago.

Modern Practice in Industrial Switchboard Design

Need for Flexibility and Safety and How These Are Met by the Dead-Front Board—Typical Installations

By D. H. COLCORD
Research Engineer, Square D Co., Detroit, Mich.

The two most desirable features in present industrial practice in switchboard design are flexibility and safety. The unusual exigencies of production during the period of the war required constant readjustment of machinery and plant managers are still compelled to continually shift machinery and apparatus to meet new conditions created by this period of industrial expansion. Labor shortage requires the employment of operators inexperienced in handling power circuits and consequently control apparatus must be so built and installed as to insure simplicity of operation and a large degree of protection. To procure the necessary flexibility and at the same time to avoid the expense of installing the more expensive type of slate or marble boards, dead-front switchboards of unit construction built of pipe, angle iron, pipe clamps, conduit, steel plates and externally operated, inclosed safety switches are becoming popular.

Switchboards of this type protect the operators, as no current-carrying parts are exposed on the face, and they are generally constructed so that all busbars and all conductors on the back of the board are inclosed. Furthermore,

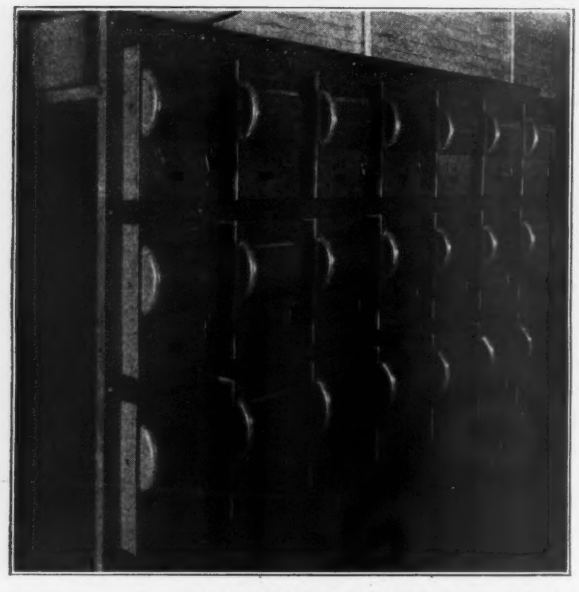


Fig. 1.—Dead-Front Switchboard in California & Hawaiian Sugar Refining Co.'s Plant, Crockett, Cal.

any motor may be locked out of production at the switch, thus preventing any one making the contact and starting the motor inadvertently while an employe is making repairs.

Dead-front switchboards of unit construction are also especially adaptable in small power plants for the control of motor-driven auxiliaries, fans, blowers, coal and ash-handling machinery, feeders and distribution circuits.

Their advantages for general industrial purposes are: They start motors from one central point, thus eliminating individual switches; they avoid the use of fuses located throughout the system; individual motors can be tested and

Fig. 2.—Conduit Wiring in the California & Hawaiian Sugar Refinery, Crockett, Cal.

proper readings made without interfering with wiring or shutting down; full protection is provided for the motors; operator at any machine can shut down the motor by touching a button; only authorized persons can start motors; such switchboards reduce cost of large motor installations and maintenance.

From the standpoint of cost the use of this type of board is important. They can be erected quickly by any capable contractor from material that is always available. Flexibility is provided in adding units with the necessary growth of a plant. To be specific, when a new group of motors is installed additional space may be added to the board and a control unit built in to operate them. Again, conditions may require that a switch directly connected to a motor may be moved to the switchboard or a switch moved to the motor as the occasion may require.

Installation of a Dead-Front Board in a Sugar Refinery.

An example of a successful dead-front switchboard is one installed in the California & Hawaiian Sugar Refining Co.'s plant at Crockett, Cal. In the first place, this switchboard (see

Fig. 1) meets the requirements of the Pacific Board of Underwriters and the California Industrial Safety Commission. The shifting of the various loads incidental to sugar refining makes a flexible board of this kind essential. The

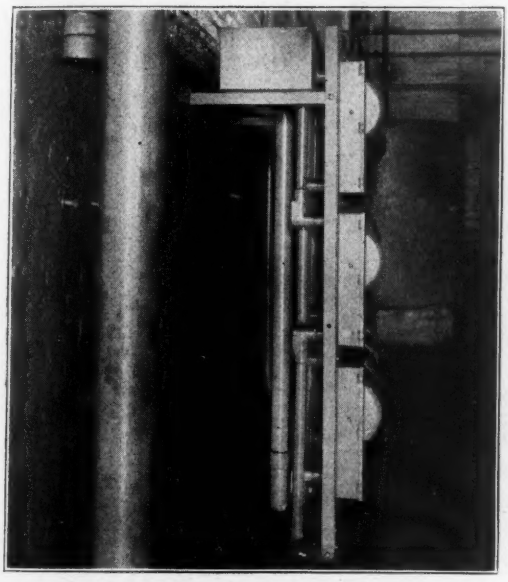


Fig. 3.—End View of Board Shown in Fig. 1. These Dead-Front Switchboards Are Also "Dead Back," All Wiring and Buses Being Completely Inclosed.

plant contains 400 motors, ranging from 1 to 200 hp. and making a total of 6000 hp. These motors operate conveyors, pumps, reels, screens, centrifugals, machine tools, etc. The daily load is very uniform as a definite tonnage of sugar is produced each hour of the 24. Power is provided by noncondensing turbogenerators operating a 480-volt, three-phase, 60-cycle circuit. The exhaust steam is used in the sugar refining process.

The main switchboard consists of three electrically operated generator oil switches of 3000-ampere rating. In addition there are 14 remote-control manually operated oil switches rated at 500 amperes, having seven feeders on each end of the bus with generator connections in the center.

Space in this plant is a considerable factor and all wiring is carried in conduits, see Fig. 2. Leading from the main switch are three 500,000-cir. mil. cables in 3-in. conduits, all carrying the same value of average load. The main conduits begin in the power house with porcelain-lined bushings near the feeder terminals of the 500-ampere oil switches. They are ganged beneath the floor line following to the first point of divergence. At this point a sheet-steel junction box, approximately 24 ins. by 24 ins., is installed where the feeders are separated into subgroups leading to various sections of the refineries. This box forms a continuous metallic bond from the feeder conduits to those running to the machines. The power-station ends are grounded by large copper plates buried in moist earth below the buildings, with auxiliary grounds to permanent water-pipe system.

The load is divided and the control grouped according to the size of motors. In one set—controlled by switches grouped in a single cabinet—all motors from 75 to 150 hp. are operated. In a second group the main feeders are run to sheet-steel distribution switchboards which control all smaller motors.

All subdistribution switchboards are planned to economize on the length of feeders, placing the boards as near the load as possible. Unit switchboards built of iron frame are readily convertible, easily moved and flexible. These units are built of No. 12 gage sheet steel 18 ins. by 84 ins., mounted on 2 by 2-in. angle-iron supports. Each panel carries three 100-ampere, three-pole, 500-volt, alternating-current, externally operated switch units. Near the top at the rear is a sheet-steel bus compartment 10 ins. by 15 ins. made of Code thickness metal. The panels are grouped to form switchboards. Each compartment is designed with a view to single panel extension, so that panels can be added from time to time. The bus material is supported on cleat insulators. All taps from switch units to busbar and from switch units to subfeeders are in conduit and enter the switch from the rear and are held to the switch by means of locknuts and bushings.

The principle which was kept in mind in running as many feeders as are used was that in order to meet the many changes both in motor horsepower and in the rearrangement of machinery, it would be necessary to gridiron the whole area with sources of power.

Dead-Front Board in a Paraffine Works.

Another switchboard that illustrates the value of a unit type of dead-front switchboard is the one recently installed by the Prjdham Division of the Paraffine Co.'s plant at Oakland, Cal. The board shown in Fig. 4 was designed for a surface-type installation as floor space did not warrant setting the board out from the wall in such

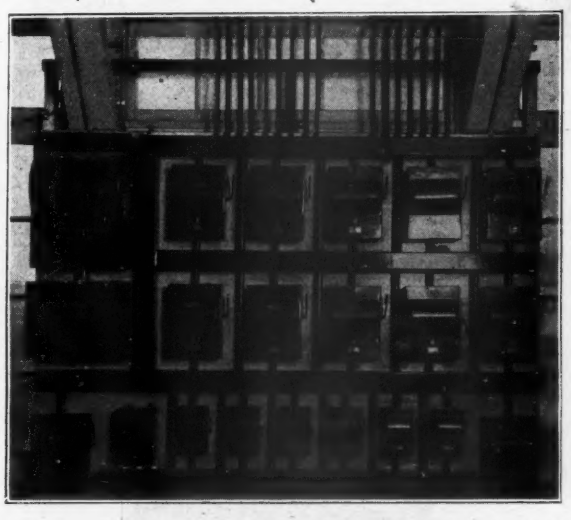


Fig. 4.—Dead-Front Switchboard in Paraffine Co.'s Plant, Oakland, Cal., Built of Externally Operated Inclosed Square D Safety Switches.

a manner as to allow back connections. Furthermore, the framework of this building is all wood and this fact, together with the great demand at the time of installation for metal products, did not seem to justify metal framework.

This board is 7 ins. high by 10 ins. in width.

The bottom of the board is 18 ins. from the floor and there is an 18-in. platform in front of the board, which not only brings the top within reach, but the platform acts as a protection from heavy material trucks which are commonly used in the factory. The frame is built of 2 by 12-in. selected pine, surfaced and sanded, and put together with dowel pins and glue. The dowel pins are extra long, running into the edge of the board, top and bottom, approximately 4 ins., which is an additional protection against shrinkage and warping. The rear of the board was painted with two coats of white lead, the front with one coat of lead and two coats of white enamel.

A gutter consisting of four cross sections and the connecting sections is made of No. 16 gage galvanized iron, black enameled, 4 ins. in depth and 5 ins. in width. The covers of these gutters are set on in sections and are fastened in place by machine screws. The three upper gutters carry the main buses, all of the same sized wire, there being no reduction in the size of wire from the main switch to the extreme end of the bus. In every case the switch is fed from the top through a conduit nipple, then out from the fuse end of the switch through a conduit nipple and through the gutter below, directly to the left to the first conduit riser and up to the top gutter. The upper cross conduits are 1½ ins. in size, allowing plenty of room for two or more circuits, which permits of the subfeed from the lower gutters passing directly up to the upper gutter, where all connections for subcircuits are made.

The feed for the extra switches is connected and terminates at a point in the upper gutter. Directly below the main switch is a metal cabinet containing meter and current coils.

The salient feature of a switchboard of the type described above is its low cost and flexibility, at the same time providing a highly desirable safety factor and an efficient control mechanism. One mechanic and helper mounted the entire board in 11 days, the material used being as follows:

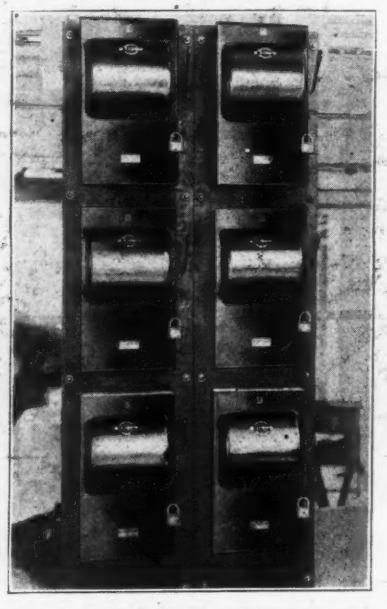


Fig. 5.—Dead-Front Switchboard Controlling Six Circuits in Sperry Flour Co.'s Plant, Vallejo, Cal.

Lumber, paints, oils and brushes, 37 ft. gutter pipe, 16 ft. of 1½-in. conduit, thirty-two 1 by 4-in. conduit nipples, 16 ft. of 1-in. conduit,

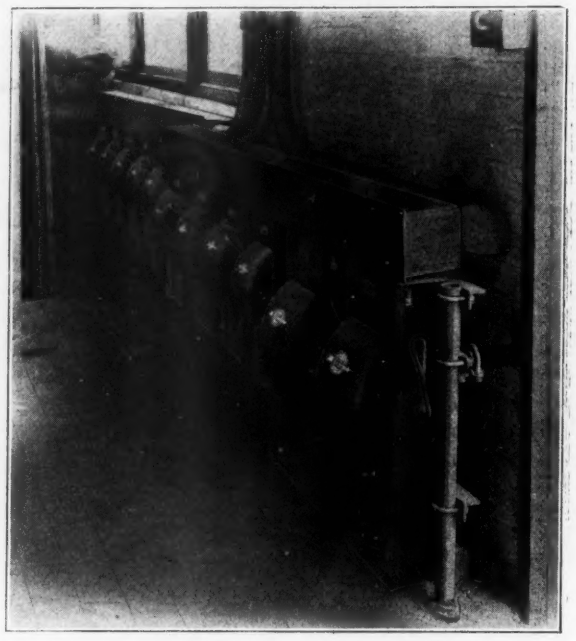


Fig. 6.—Dead-Front Switchboard in General Fireproofing Co.'s Plant, Youngstown, O.

sixteen 1½-in. monitor bushings, thirty-two 1½-in. locknuts, seventy-two 1-in. monitor bushings, one hundred and forty-four 1-in. locknuts, 100 ft. of 400,000-cir. mil. main bus cables.

CHARACTERISTICS OF ELECTRON TUBE GENERATORS DETERMINED.

Owing to saturation and rectification effects in three electrode vacuum tubes, the currents which they deliver to any type of output circuit, when used as a generator, are heavily loaded with harmonics. Experimental results indicate that the frequency of the oscillating currents generated is the natural frequency of the output circuit. Hence this circuit behaves as a filter in series with the tube and the direct-current power system, the useful output current being approximately sinusoidal, whatever the distortion of the tube currents, depending in amplitude solely upon the fundamental constituents of the tube currents. In the investigations of Lewis M. Hull, assistant physicist of the Bureau of Standards, published in Scientific Paper No. 355, general expressions are derived for the power and current output in terms of static characteristics of the generating tube, and are corroborated by experimental results obtained with a particular tube.

Copies of this paper may be had for 5 cents each from the Superintendent of Documents, Government Printing Office, Washington, D. C.

WILL ELECTRIFY BRAZIL LINE.

The Barra-Pirahy (Brazil) trunk line is to be electrified before 1922 at a cost of approximately $4,000,000. Tenders for this project are invited from American manufacturers.

GEOLOGICAL SURVEY'S POWER REPORT FOR JULY.

About 39% of Total Output of Public Utility Power Plants Was Produced by Water Power.

The Division of Power Resources of the United States Geological Survey has issued its report on the production of electric power and the consumption of fuel required therefor by the public utility power plants of the United States in July, 1919. Revised comparative data are also given for the months of February, March and April, 1919. These three months were covered in earlier reports published in previous issues of the ELECTRICAL REVIEW, so that only the corrected totals for these months are given below. No data have been furnished for the months of May and June, 1919.

These reports are based on returns received from about 3000 electric power plants engaged in public service, including central stations, electric railways, and certain other plants which contribute to the public supply. Returns were received from plants whose aggregate capacity of generators is about 90% of the total installed capacity of generators of public utility plants. Estimates of the output of plants which did not submit returns were made from available information. The figures given are subject to revision in subsequent statistical reports of the Geological Survey relating to power production. For last July the figures reported are as follows:

State.	Thousands of kw. hrs. produced. By water power.	By fuels.	Fuel used for power production. Coal, short tons.	Petroleum and derivatives, bbls.	Natural gas, M. cu. ft.
Alabama	28,442	3,689	15,458	8	0
Arizona	7,478	18,877	7,315	61,030	0
Arkansas	88	7,692	8,364	450	182,848
California	200,528	116,804	0	550,799	242,228
Colorado	14,947	12,177	27,888	174	0
Connecticut	5,943	48,182	67,513	213	0
Delaware	0	5,225	6,604	0	0
District of Columbia	0	19,221	21,412	0	0
Florida	942	7,731	3,193	30,745	0
Georgia	34,224	6,595	13,560	2,386	0
Idaho	50,209	1,219	88	9	0
Illinois	15,323	183,518	304,160	984	0
Indiana	2,736	54,354	142,587	402	1,878
Iowa	51,802	24,531	69,703	720	0
Kansas	981	35,068	50,817	60,742	80,846
Kentucky	4	19,205	39,390	341	0
Louisiana	0	15,518	11,324	30,508	63,624
Maine	17,678	220	534	0	0
Maryland	329	16,378	25,951	30	1,350
Massachusetts	15,163	110,467	130,506	21	0
Michigan	50,043	108,402	129,612	204	0
Minnesota	37,436	10,929	25,866	832	0
Mississippi	0	5,206	13,272	443	0
Missouri	2,237	39,132	82,045	18,847	0
Montana	83,220	848	4,894	502	912
Nebraska	1,302	16,602	31,904	3,387	0
Nevada	2,559	720	195	1,780	0
NewHampshire	4,499	3,814	5,808	3	0
New Jersey	151	79,546	116,944	79	0
New Mexico	144	1,603	4,133	1,610	0
New York	212,033	276,828	336,004	1,224	56,949
North Carolina	45,317	7,243	14,915	20	0
North Dakota	0	2,449	14,808	553	0
Ohio	2,378	208,240	283,658	689	*512,586
Oklahoma	161	13,826	8,717	20,067	474,930
Oregon	29,130	4,323	222	5,664	0
Pennsylvania	52,648	238,021	388,957	297	40,531
Rhode Island	240	19,821	22,648	0	0
South Carolina	42,649	3,480	8,281	102	0
South Dakota	3,468	2,920	6,841	3,192	0
Tennessee	32,316	9,164	22,156	82	0
Texas	191	45,537	29,269	188,691	114,148
Utah	12,405	0	0	0	0
Vermont	11,748	976	3,909	2	0
Virginia	17,666	19,336	30,674	122	0
Washington	79,881	5,434	2,060	22,071	0
W. Virginia	1,399	66,523	83,556	45	264,054
Wisconsin	41,512	27,637	46,221	574	0
Wyoming	179	3,386	12,752	4,008	3,481
Total	1,213,729	1,928,617	2,676,688	1,014,652	2,040,365

*Includes 182,415 artificial gas.

For July the total electric power production by both water power and fuels was 3,142,346,000 kw-hrs., compared with 2,982,856,000 in February, 3,149,871,000 in March and 3,026,096,000 in April.

The average daily output for the four months is reported as follows: February, 106,531,000 kw-hrs.; March, 101,609,000; April, 100,870,000; July, 101,366,000.

The percentage of the total electric power output produced by water power was, in February, 39%; in March, 42%; April, 43%; July, 39%.

ITALY NAMES NEW SUBSIDIES FOR POWER DEVELOPMENT.

Grants Are Extended to Include Transmission Lines for Carrying Electrical Current.

In a report to the Department of Commerce under date of Dec. 2, 1919, H. C. MacLean, trade commissioner at Rome, points out that the Italian Government has issued a new decree which will further stimulate interest in the establishment of hydroelectric plants and the use of electric power in Italy. Under a decree dated Nov. 15, 1919, the Italian Government will grant to all hydroelectric plants, construction of which was commenced after Jan. 1, 1919, or which were begun during the four years preceding this date, but which had not been completed when the decree became effective, an annual subsidy of 40 lire for each nominal hp. developed under the terms of the concession. This subsidy will be paid for a period of 15 years after the plant is actually in operation, but in no case will it be extended beyond the year 1940. In addition, the plants entitled to such subsidy shall be free from both the normal tax and the supertax on buildings for the same period.

In addition to the subsidies for the construction of power plants, provision is also made for new distribution lines. To those who construct and operate new lines for the transmission of electric power at a tension greater than 2000 volts, subsidies will be granted for 15 years, beginning with the date on which the line was put in use. These subsidies vary according to the weight of copper employed in the line, running from 0.15 to 0.25 lire per kw. They will be granted not only when new lines are constructed, but also to all lines now in use the construction of which had not been begun on Jan. 1, 1919. Transmission lines begun after Dec. 31, 1921, will receive a subsidy, the amount of which will be determined for periods of three years.

Provision is made for encouraging the use of electric power in connection with agriculture and irrigation. A premium of 0.03 lire per kw-hr. will be paid for a period of not more than 10 years to firms, or individuals, for current utilized exclusively in the cultivation and harvesting of crops. The same premium will be paid where irrigation works are supplied with water electrically pumped. Those operating electric plants enjoying subsidies from the government are obliged to reserve a portion of the current produced, up to 10%, which must be furnished at the price made to the most favored user for agricultural or reclamation projects.

Editorial Comment

Exposing Municipal Ownership Fallacies

The fallacy of government and municipal ownership of public utilities seems to have become a favorite topic among men high in public life who have had reason to observe the working out of such ownership and operation in different sections of the country. Much of the discussion has been brought about through the government operation of the railroads and their prospective return to their owners.

The enormous cost of railroad operation under government control, a deficit of something like $700,000,000 having been piled up at this time, has led thinking men to look into the operation of utilities owned and operated by municipalities and in most cases it has been found that the cost of operation of such plants far exceeds that of privately owned ones.

Gov. James P. Goodrich of Indiana, in an article in the January issue of the *National Electric Light Association Bulletin,* says, "While I would not be disposed to measure the possibilities of government operation wholly by the experiences of public operation during the war period, yet I believe private operation under public supervision to be far superior to any other system we can devise at this time."

To be sure, there are many examples of poor operation of public utilities under private ownership and management, but the poorly managed, expensively operated private-owned plants are but a drop in the bucket when compared with the numerous examples that can be found in municipally owned and operated public utilities.

Take the lighting situation: How many municipal plants are operated as economically as privately owned ones? A glance through newspapers of different sections will answer that question speedily when in less than a week it was gleaned from scattered papers that no less than six cities and towns, now operating their own lighting plants, have decided to discontinue them and buy energy from privately owned companies. This fact was discovered through casual reading of newspapers and not from any compilation made on behalf of any utility.

Governor Goodrich in his article made some interesting comments on the general conditions in municipal lighting plants as brought out through investigations made by the Indiana Public Service Commission. In one case it was shown that 15 out of 32 consumers of a certain plant were paying less than the cost of generating the energy consumed, no allowance being made for return on the investment. There was an "inefficient combustion of coal" at the plant, 7.92 lbs. of coal being required to develop one kw-hr. According to this same source, it is not uncommon in Indiana to find publicly owned utilities which require as much as 10 to 12 lbs. of coal per kw-hr. generated. Electrical utilities, efficiently conducted under private management, are able to produce a kilowatt-hour from 3 to 4 lbs. of coal.

Back of all the inefficiency in municipally operated plants, especially in the larger cities, there is the one big contributing element that can be expressed in one word—"politics." It is perfectly true that some very fine municipal plants are maintained entirely free from political influences. Likewise, it is perfectly true that one municipally operated plant in a city may be free from political influence and another in the same city literally honeycombed with it. Look over the towns and cities where you know municipal plants are operated and you will find the above statement absolutely true.

And that is the real answer, for in plants dominated no matter to how small a degree by political control the loyalty of employes, so absolutely essential to proper and efficient operation, is lacking. Privately owned plants are always striving to develop this personal loyalty. In municipal plants loyalty to the city and the public service usually counts for naught. How many votes the employe controls is unfortunately almost invariably the main thing.

Economy in Wiring Through Allowance for Demand-Factor

In the general rules on wiring it is the common practice to assume that the sizes and carrying capacity of the wires must be based on the total connected load unless it is definitely known that the total connected load will never be all in active service at any one time. In special cases certain allowances have been made where it was obviously impossible to operate all the load at one time, as where one feeder supplies two circuits through a double-throw switch. There have arisen many cases, however, of service to a group of motors, electric ranges, etc., where the likelihood of all taking full load simultaneously is extremely remote. In such cases the

requirement of combined full-load capacity in the feeder is obviously unwarranted and serves merely to increase the cost of the installation. Feeders being usually of large size, are already quite expensive. Therefore, any additional margin of size runs up their cost quite materially.

The outcome of this matter has been a request by a considerable number of central stations, electrical contractors and engineers to permit the use of feeder sizes ample only for the maximum demand to be imposed on them instead of the total installed or connected load. This subject has formed a special topic of discussion at several conventions of the Western Association of Electrical Inspectors, notably that of last week, when Mr. V. H. Tousley read a report including a considerable number of suggested demand-factors; this report is reproduced on other pages of this issue. It is deserving of careful consideration and the factors given should be compared with others found suitable under similar conditions. While there may be some question as to whether such demand-factors can be standardized in view of varying conditions likely to be met with, there is no doubt but that acceptable values for them may be restricted to a fairly small range.

Although under no obligations to take the initiative in this matter, the inspectors are showing a laudable spirit in considering the subject so that they may act intelligently on it when it comes up in any case. Co-operation between different branches of the industry, long looked upon merely as an ideal, is now actually becoming a reality.

Electric Trucks and the Oil-Burning Power Plant

Few people appreciate the extent to which fuel oil has been adopted by many power plants that formerly burned coal. This condition obtains more especially in the New England states and other territories where oil is readily accessible by water and transportation facilities are specially favorable. The power plants that have taken to oil fuel in preference to solid fuel are in the main industrial power plants and plants for supplying heating systems.

The rapidly increasing use of liquid fuel, and this covers the consumption of gasoline for automotive purposes, has caused to spring up huge transportation systems for the secondary distribution of oil from the location of its storage to the location of its consumption. What are ordinarily known as tank farms are maintained accessible to steamship and railroad facilities, as the case may be, and where they can as far as possible be isolated and segregated on the score of fire and explosion hazards. These tank farms have a storage capacity from a few thousand to many hundred-thousand barrels of oil. From these tank farms the oil is moved to points of consumption—a process which we are calling secondary distribution—by tank cars and motor trucks. These trucks usually have a capacity of between 1500 and 2280 gallons apiece, the oil weighing about 8 tons. Such a load of oil suffices to yield about 2000 hp. per 10-hr. day. These tank trucks are able to discharge their load in from 3 to 5 minutes.

A large power plant obtains its fuel by rail or water, regardless of what that fuel may be. Smaller plants are often forced to receive their fuel by vehicle, horse-drawn or self-propelled. Herein the conditions are somewhat different for oil as compared with coal. Haulage of coal from coal pocket to power-plant bunker rarely exceeds five miles and is usually considerably less. With oil fuel, however, the haul may easily be five miles, and in many instances in the New England states the distance is ten miles. This is a relatively long haul and is necessary because tank farms cannot spring up as can coal yards and coal piles. While as time goes on and the use of fuel oil increases, insurance dictums, and rearranged primary and secondary methods of distribution may do much to reduce the long haul from tank farm to power plant, the fact remains that the movement of comparatively small amounts of oil—representative of a very much larger amount of coal on a thermal-unit basis—over a long distance is one that opens up a field for thought.

The service, *par excellence,* for the heavy electric truck is that of moving a heavy load slowly. A further favorable condition is that the route be known and somewhat definite. In other words a clearly prescribed load and route are the ideal conditions for electric trucking, as it enables truck and battery to be proportioned to the load and battery recharging to be undertaken to meet a clearly definite condition. Moving fuel oil from tank farm to power plant constitutes just such an ideal form of load.

Gasoline-driven tank trucks are now making round trips totaling 20 miles with 8-ton loads of oil, including loading and unloading in 1½ hours. The electric truck can do as well and it will do it at less cost for upkeep, for energy, for insurance and supervision. A power plant using fuel oil might find it financially worth while to transport its own oil in its own electric trucks.

The increasing use of oil in all its forms is giving rise to many new problems and new opportunities. Only one has been mentioned but it is one that is offered as being of especial interest to the users of fuel oil and the electric truck manufacturers.

Current Events

Broadening Electrical Conference Organization—Edison's 73rd Birthday — Western Inspectors' Convention Ends

TO DEPARTMENTALIZE HEADQUARTERS ACTIVITIES OF N. E. L. A.

Engineering and Publicity Departments to Be Added —M. H. Aylesworth Made Executive Manager.

In order to strengthen association activities by making individuals responsible for certain work, the Executive Committee of the National Electric Light Association, on recommendation of President Ballard, at its meeting in New York last week, resolved to departmentalize that work at headquarters and reorganize the executive control through the Executive Committee in such a way as to give all parts of the country representation in direct proportion to the volume of business done.

M. H. Aylesworth, whose title has been changed from executive assistant to the president, to executive manager of the association, has prepared a full report on this subject which is now being studied by a committee appointed for the purpose. This committee is composed of Vice-president Frank W. Smith, Vice-president M. R. Bump, Chairman J. G. Learned of the Commercial Section, Chairman I. E. Moultrop of the Technical and Hydroelectric Section, Chairman W. C. L. Eglin of the Constitution Committee, and M. H. Aylesworth, executive manager.

Such a plan would involve certain expenditures and so this committee and Treasurer H. C. Abell, in conjunction with the Finance Committee under Chairman J. B. McCall, is studying plans for financing the activities under the new plan. The plan will not be effective until July 1 next, subject to approval of the convention at large at Pasadena in May.

Under the plan it is proposed to add two departments at once, one of engineering and the other of publicity, to the three existing departments of committee service, company service and financial and accounting.

Manufacturers Appointed to N. E. L. A. Public Policy Committee for First Time.

In keeping with the broad purpose of usefulness of the present administration, the National Electric Light Association has for the first time gone outside the electric light and power field for members of one of its major committees. At its meeting on Jan. 30, the Executive Committee of the association confirmed the president's appointment of Guy E. Tripp, chairman of the board of the Westinghouse Electric & Manufacturing Co., and O. D. Young, vice-president, General Electric Co., as members of the Public Policy Committee. This action of the association by President R. H. Ballard was characterized as the "first step in the new era of the united industry."

In his telegram of notification, John A. Britton, chairman of the Public Policy Committee, said "For many years I have been strongly of the opinion that the association would be largely benefited by a more direct contact with the manufacturers. There is a relationship in the industry that makes manufacturers as essential to the success of the organization as operators." Mr. Britton urged acceptance for the good it will do the industry as a whole.

President Ballard to Tour South.

President R. H. Ballard will tour the South on his return home to Los Angeles, leaving New York Feb. 7. This is part of his program to see and meet men in the different sections of the country to talk over things electrical and particularly to talk over N. E. L. A. affairs.

The first stop in his itinerary is Atlanta, Ga., on Feb. 9. He expects to be in New Orleans, La., Feb. 11; Dallas, Tex., Feb. 13; El Paso, Tex., Feb. 15 and 16; Albuquerque, N. M., Feb. 17 and 18, meeting with the New Mexico Electrical Association; Phoenix, Ariz., Feb. 19, meeting with the Arizona member companies.

A. R. Wishon, president of the Pacific Coast Section, and K. E. Van Kuran, chairman of the Coast Commercial Section, will meet President Ballard in El Paso and continue on with him to Los Angeles, where he expects to arrive about Feb. 20.

CONFERENCE CLUB TO ENLARGE ITS SCOPE.

Important Meeting at New York City Prepares to Dedicate the Club to Co-ordination of the Electrical Industry as a Whole.

The words of John Stuart Mill that growth in capacity for and practice in habit of co-operation is the test of an advancing civilization were the keynote of the twelfth meeting of the Conference Club that was held in New York City on Jan. 29-31. Until the present time, the club has represented only a part of those engaged in the electrical industry. Certain very important groups in the industry have not availed themselves of the benefits that flow from identification with it. But those who have been responsible for the club's inception and growth feel that its ideals, which are so praiseworthy and are those of the entire electrical industry, should knit the industry into a common organization for the betterment of all concerned.

President L. K. Comstock opened the meeting by declaring that the Conference Club is destined to establish relations based on fraternity

rather than enmity by erecting a forum whereon questions that affect the electrical industry may be discussed frankly and without fear of jealousy. The club will be an instrument that will translate fraternity and co-operation into terms of concrete results. It will strive to eliminate suspicion among the different groups of the industry by bringing them closer together so that one may appreciate the difficulties with which another contends.

The business conducted at the Thursday morning session consisted of the appointment of a Trade Relations Committee and the presentation by Secretary Sullivan W. Jones of the report of the Committee on Conference Club Program.

COMMITTEE ON CONFERENCE CLUB PROGRAM.

This committee met on Oct. 30, 1919, to organize and to agree on policy and procedure. At this meeting the committee agreed that the Conference Club could not make satisfactory progress on its program that contemplated changes in the relations between contracting and other branches of the industry without the co-operation of these branches. The committee, after coming to the conclusion that conditions were ripe for some sort of co-operative movement, turned to the reorganization of the club that was suggested in the report of the Committee on Constitution and By-Laws read at the tenth meeting.

This report stated that the problems in the electrical industry could be settled by general discussions and agreements. The forum in which these discussions may be held, however, is wanting. The Conference Club can be made to meet the requirements by a broadening of its policy and by a change in its membership. In its deliberation, the committee evolved several questions, the most important of which follow:

1. Will the solution of the problems now confronting and yet to confront the electrical industry be simplified and expedited by securing a meeting of interested minds through applying the Conference Club idea?
2. Will the present Conference Club members share with others performing different functions in the industry the greater benefits which we know from experience must ultimately flow from applying the Conference Club method to the formulation of correct operating principles for the whole industry?
3. How much more can the Conference Club as now constituted accomplish for its present members; and is it not altogether probable that anything it might yet accomplish could be secured in even greater measure by joining its effort to similar efforts in other branches of the industry?
4. Have we not reached the point where we should direct our efforts along two distinct lines: (1) to build up and strengthen the National, and (2) to organize the whole industry? Is not this the time for us to infuse into both of these efforts all we have to give of what the Conference Club has taught?

The committee explained that the proposed new Conference Club as conceived is to be an open forum, a debating society, where ideas can be presented and discussed, but without any authority to impose its will on any branch or any individual in the industry.

The Committee on Conference Club Program reached the conclusion that the time had now come to dedicate the Conference Club with its traditions to the electrical industry, to be utilized as the industry might decide for producing an orderly, balanced co-ordination of group functions which would make possible a healthy normal development, resulting in maximum service to the consumer and increasing benefits to the industry.

Discussion at the afternoon session disclosed the fact that opinion was unanimous about the report of the Committee on Program. Seven groups of the electrical industry exist at present that are distinct and well organized: namely, the manufacturers, the contractors, the jobbers, the central stations, the societies, engineers and architects, and the technical press. Although these groups have well defined group organizations, they have no means of establishing interrelations between themselves, no satisfactory vehicle by means of which the ideas, aims and ideals of one group can be communicated to another group without selfish instincts and suspicion arising to nullify the benefits that came from association. Each group is a part of one great industry. But in spite of that fact there has been little concerted effort to co-ordinate the parts of the industry. This co-ordination will not occur by leaving the development of enterprise to individuals. The responsibility rests on all groups alike. They can meet that responsibility only by organization whereby right relations are based upon the law of common need.

There was general agreement with the report of the Committee on Program, particularly with the part that said that there are two kinds of organization, typified by the character of function performed.

One is a thought-organization. The second is a will-organization. The thought-organization is one which, with evidence and facts as a basis, decides through reasoning and deliberation upon broad purposes and fundamental principles. A will-organization is one in which individuals reach compromise agreements for the purpose of collective action under majority rule. Organizations of the latter type in business have to exercise great care with respect to the matters upon which agreement is reached lest the law regard them as conspiracies. Governments and government commissions generally, trade unions and the like, are examples of will-organization. On the other hand, the President's cabinet is a thought-organization. The Conference Club is predominantly a thought-organization.

Perhaps the distinction between these two types of organization can be made a little clearer by describing the thought-organization as a "What to do" organization, and the will-organization as a "How to do it" organization. These two organizations in business and government function simultaneously.

The present organizations in the electrical industry are "How" or will-organizations. Within each there is an executive committee or other body that is functioning perhaps as a "What" or thought-organization. These organizations are functioning successfully in each branch of the industry, but something more is needed to overcome the separateness of interest and policy, and the natural tendency, common to all, to pull away from a single broad purpose or policy.

What is needed in this situation is a thought-organization that can through its influence co-ordinate the purposes of the branch organizations as these purposes bear upon interrelations. This central organization should have no mandatory powers of any kind, not because the exercise of such powers would be illegal but because they are not necessary and because the organization will function more effectively without them. The feeling is that such an organization should derive its strength from voluntary adherence to principles enunciated because they are sound.

With such an organization, thoroughly representative of all interests, functioning in the industry, the problems of trade relations and trade developments will be quickly and satisfactorily solved. Without such an

organization, the settlement of these questions is still a long way off. The committee reached the conclusion that no program for changing trade relations or designed to clear the way for development will be practicable until an organization is created which can formulate for the whole industry those principles which may constitute a fundamental economic and ethical code for the future guidance of groups and individuals. The Conference Club can render no greater service to the industry than that of initiating a movement with the creation of such an organization as its purpose.

Those who discussed the subject included F. S. Price, F. A. Mott, T. P. Curtis, W. C. Peet, J. J. Gibson, W. E. Bickford, C. Wheeler, F. W. Cooper, W. L. Goodwin, J. Q. Jackson, Bassett Jones, W. H. Onken, and Col. Robley D. Stearnes.

Committee on Trade Relations and Trade Development.

The personnel of the Trade Relations Committee included members representing the contractors and the jobbers. Contractors' representatives included F. W. Cooper, E. J. Ellis, J. M. Watters, J. A. Cole, W. C. Peet, F. A. Mott, O. H. Caldwell, S. W. Jones, W. L. Goodwin, J. J. Gibson, and G. E. Stewart, chairman. Jobbers were represented by F. A. Price, F. R. Bernarden, and E. W. Rockafellow. Because of Mr. Rockafellow's inability to attend the meeting of the committee, he was supplemented by H. L. Grant. The committee met late on Thursday afternoon.

Discussion of the report of the Committee on Trade Relations and Trade Development occupied the entire Friday morning session, at the end of which a committee composed of L. K. Comstock, chairman, F. S. Price, and J. J. Gibson, was appointed to meet the members of the Executive Committee of the National Electric Light Association, then in session in New York City, to convey the congratulations of the Conference Club to that committee, and to invite members of that committee to attend the meetings of the Conference Club and to participate in its discussions.

The report of the Committee on Trade Relations and Trade Development was as follows:

In view of the action taken at the session yesterday afternoon, the Committee on Trade Relations and Trade Development found itself in a position, when it met with the Jobbers' Conference Committee, where there was no real necessity for performing the function for which it was primarily created. Its purpose was to discuss with the Jobbers' Committee the broad principles of co-operation between the contracting and jobbing groups and to arrive at some understanding on procedure for the future, with the ultimate object in mind of making its effort contributory to the results which had already been accomplished when it met. At the meeting the manufacturers and press were represented as well as the jobbers and contractors. Had there been anybody available representing the central-station interests he would have been invited to sit in the meeting.

It is significant that when the committee met they at once began to discuss trade relations and this led directly to a consideration of the organization which had been discussed and upon which agreement had been reached at the afternoon session. It was felt that the Trade Relations Committee of the future organization would necessarily be a joint committee representing the interests involved. Almost unconsciously the committee resolved themselves into just such a Joint Committee and proceeded to discuss the manner in which the organization which it had been decided to create should be brought into existence. The conclusions of the committee are herewith presented as a basis for discussion by the Conference with the thought that such a discussion will lead to agreement on future procedure.

The committee believes that the future Conference should be ultimately composed of representatives of the contracting group, the jobber group, the manufacturers and the central stations, the engineers and the architects, and the press.

The committee feels that the membership in the future Conference should be limited.

The committee feels that a place should be provided in the membership for counsel whose past activities and associations have made them peculiarly familiar with the problems confronting the various groups.

The committee feels that no member of the Conference should have the privilege of sending alternates to the meetings.

The committee feels that the members of the future Conference should be selected by the Conference.

The committee feels that an entirely new constitution and by-laws should be prepared and that a committee representing all of the principal interests should be appointed at this meeting for that purpose.

Contract Forms Discussed.

Tentative drafts of three contract forms prepared by the Committee on Credits of the Conference Club were read and criticized at the Friday afternoon session. These drafts which, when perfected, will be published as the standard forms of the American Institute of Architects and are intended for recommended practice rather than for inflexible use, refer to the obligations of the subcontractor. They include the standard form of subcontractor's proposal, the standard form of agreement between subcontractor and contractor, and general conditions of the subcontract.

The work of drafting a form of contract to which the electrical contractor and owner are the parties is well advanced. When it has been completed, the drafting of the cost-plus documents will be started. The committee has done no work on credit relations between the contractor and those from whom he purchases materials and apparatus. That whole subject must be taken up later in connection with the work on trade relations of which it is an important part.

The use of trade acceptances as instruments of payment for construction work has been discussed with the Committee on Contracts of the American Institute of Architects and a co-operative program for educational work encouraging their use will be formulated.

After several minor changes in verbiage were made, the contract form as amended was adopted.

The date and place of the next meeting was left to the judgment of the Executive Committee. The sentiment expressed on the floor was that it should be convened most satisfactorily some time near the date of the meeting of the jobbers and that of N. E. L. A., but at a place more centrally located. Hot Springs was suggested. A motion that was carried urged the Executive Committee to continue the tenure of office of the present incumbents until the reorganization of the Conference Club is effected.

A dinner at Delmonico's, at which 72 were present, closed the sessions of the twelfth meeting. Those who contributed to the program were L. K. Comstock, R. H. Ballard, Judge C. W. Appleton, J. Q. Jackson, Frank S. Price, Bassett Jones, William Stanley Parker and W. H. Onken.

THOMAS A. EDISON 73 YEARS "YOUNG" NEXT WEDNESDAY.

Edison Pioneers, and Other Organizations, to Aid in Celebration of Birthday.

Thomas Alva Edison, wizard of the electrical industry, will be 73 years old on Wednesday, Feb. 11, and most people connected with matters electrical, except probably Mr. Edison himself, are planning some notice of the day.

Saying that Mr. Edison is 73 years old is technically correct but a more happy way of phrasing it would be "73 years young," for years seem to mean nothing to the "grand old man of electricity" and to those who have come in frequent contact with him he appears just as young now as he did a quarter of a century ago.

Working to make the 73rd birthday celebration worth while is the Edison Pioneers, an organization formed two years ago on Mr. Edison's birthday and composed of men who were associated with Edison in his work and enterprises up to 1885. This organization calls attention to the fact that "73" is the telegraphic symbol for a greeting and general expression of good will and asks that all trade organizations and publications give Mr. Edison "73."

Here is "73" from the ELECTRICAL REVIEW to Mr. Edison coupled with the earnest wisb that this publication may be able to send a similar greeting to Mr. Edison on Feb. 11 for many years to come.

OF DUTCH DESCENT.

The Edison family was originally of Dutch descent and originally settled in New Jersey but the Loyalist movement carried the family to Nova Scotia when Samuel Edison, father of T. A. Edison, was, born in 1804. In 1828 Samuel Edison married Nancy Elliott, a Yankee "schoolmarm," and later the family settled at Milan, O., where on Feb. 11, 1847, Thomas Alva Edison was born.

In 1854 the family moved to Port Huron, Mich., where Edison, though he had little schooling, developed studious habits, became a great reader, especially in natural science, and established a miniature chemical laboratory—his first in a long series—in the cellar of his home. When he was only 12 years old he obtained a job as "peanut butcher" and newsboy on the Grand Trunk Railway, running between Detroit and Port Huron, his main object in taking the job being that it would give him access to unlimited books and magazines

In the baggage car of the train, which made round trips daily between Detroit and Port Huron, young Edison built a small laboratory and everything went fine until one day an explosion nearly blew the baggageman from the car, wrecked a lot of baggage and tied up traffic on the road for some time. Young Mr. Edison was divorced from his "peanut butcher" job right there.

But he had picked up a smattering of telegraphy and in that same year, 1859, he built a line from the Port Huron depot to the center of the village and perfected himself as an operator, taking his first regular position with the Grand Trunk at Stratford Junction, Ont., in 1863. Following this came five years of roaming the Central West and South as an operator, reading and experimenting, until in 1868 he entered the office of the Western Union in Boston.

BECOMES ELECTRICAL ENGINEER.

The next year found Edison in hard luck in New York City until he happened to casually repair apparatus for the Gold & Stock Telegraph Co., winning thereby the position of superintendent at a salary of $300 per month. He immediately proceeded to improve and invent stock tickers and formed with F. L. Pope, a firm of "electrical engineers," which inserted in a telegraph journal the first professional "ad" for that branch of expert work.

Some Edison Stories.

Anecdotes and yarns about Mr. Edison are innumerable. Here are a few that came to the personal experience of the writer while working on a New York newspaper. The writer, having spent his schoolboy days in Port Huron, Mich., had met Mr. Edison many times when the inventor paid visits to his father, Samuel Edison, and W. Pitt Edison, his brother, both of whom lived in the Michigan town.

On Feb. 11, 1912, the writer was sent to interview Mr. Edison on "How it feels to be 65 years 'young.'" He found him in a far off corner of the big Edison plant in West Orange, N. J., and was greeted with, "Well, what do you want to know about old Port Huron today?"

"I came to find out how it feels to be 65 years 'young,'" was the reply.

"Why ask that question today?" asked Mr. Edison.

"This is Feb. 11, and that's the date of your birthday, isn't it?"

"So it is," said Mr. Edison, a slow puzzled smile crossing his face. "Well I'm darn glad you told me about it. How old am I today?"

A number of years ago a very distinguished group of French and Spanish business men visited this country and under the guidance of some equally distinguished gentlemen from the State Department in Washington visited the West Orange plant. Edison at that time was head-over-heels in work on the development of his cement house idea and was half a mile away from his office at the cement plant when his visitors arrived. Word was sent to him but he took his time while his silk-hatted, wonderfully tailored group of visitors waited for him in his office. Finally the door of Mr. Edison's inner sanctum opened and in he walked into the reception room. He was clad in a much mud-bedaubed, cement-stained pair of overalls, ragged, equally bedaubed sweater, weird looking cap, while on his feet were a pair of rubber boots that left big gobs of cement with every step he took on the polished hardwood floor. His visitors were aghast. His costume didn't feaze Edison in the least.

In the fall of 1914 a big fire at the Edison plant did immense damage to some new concrete construction buildings, that had been finished but not put to use. The buildings were still filled with scaffolding and other wooden material that made good fuel for the flames.

Edison stood looking at the flames shooting through the windows and quietly remarked: "I always wondered whether those darned buildings would stand fire. Now I know. They won't burn themselves, but darned 'em, what's in them will burn."

Receiving $40,000 cash for some of his inventions, in 1870 he opened an electrical factory in Newark, N. J., and a year or two later became famous with his invention of the quadruplex telegraph system, followed in quick succession with various telegraph instruments—automatic, multiplex, sextuplet and duplex—the motorgraph, carbon rheostat, microtasimeter, etc., not forgetting the paraffin paper now in universal use for wrapping purposes.

In 1876 Edison moved his shop to Menlo Park, N. J., and there in 1877 invented the phonograph. During 1878 Edison turned his thoughts to obtaining light from electricity. Arc lights of large candlepower illumination were known but what Edison was working on was the "subdivision of the electric light," so that a small unit like the gas jet, the tallow candle, or the oil lamp would be available. On Oct. 21, 1879, his invention of the incandescent electric lamp was perfected. That day, after laborious efforts, he carbonized a piece of cotton sewing thread bent into a horseshoe loop, sealed it in a glass bulb from which the air had been exhausted up to one-millionth of an atmosphere, put it in circuit, lit it up to a bright incandescence and kept it intact for over 40 hours.

Spent Millions on Separator.

As far back as this time Edison was working out ideas for a magnetic ore separator but it was not until 10 years later that he got actively to work on this. From 1891 to 1901 he gave much of his time, and more money than he could spare, to his great iron ore-crushing and separator plant in Western New Jersey and when he had 200,000,000 tons of low grade ore in the neighborhood and was ready to treat it, the great deposits of rich Bessemer ore in the Mesaba range of Minnesota became available. As the Edison plant could not possibly meet this competition of nature. Edison was forced to abandon the venture in which he had spent millions of money but it is characteristic of the man that he did it in these words: "It's all gone, but we had a hell of a good time spending it."

At once he took up the cement industry, introduced a number of leading innovations and became one of the largest manufacturers of cement in the world. Later he developed the idea of fabricating cement houses with a set of iron moulds.

Preceding much of this came the Edison invention of the picture camera in 1891, and here again he laid the foundations of an entirely new art. With his mechanism and the ribbon film began the era of the motion picture.

During the World War Mr. Edison served as head of the Naval Consulting Board and devoted himself largely to military and naval problems, such, as for example, those connected with the suppression of the submarine boat.

Loves Chemistry Research.

Mr. Edison has always had a passionate love of chemistry and all his life has followed its development so closely that electricity might be said to be relegated to a second place. His profound chemical knowledge stood him in good stead in 1914 when the supply of carbolic acid from Europe was cut off by the war. He proceeded immediately to make the acid, synthetically produced it in 18 days and within a month was able to turn out a ton a day. Dependent on benzol for this synthetic process, he next found the supply of that very precarious; and thereupon proceeded to erect and operate great benzol plants in this country and Canada, from which adequate supplies are now secured of benzol, toluol, solvent naphtha, naphthaline and xylol. The crying needs of the rubber and textile industries for myrbane, aniline oil and aniline salt next came to his notice, and a plant was soon put in operation to meet these demands. In sequence to this arose the shortage in the fur industries of paraphenylenediamine, hitherto obtained from abroad, and once more Edison came to the rescue. And thus it has gone on, so that it would be hard to say just what is the latest "drive" into the chemical industries that Edison has made on his own initiative or in response to urgent appeals.

Edison has received innumerable degrees and marks of recognition, the latter including the Albert gold medal of the Royal Society of Arts of England and the John Fritz gold medal of the four national engineering societies of America. The Edison gold medal was founded in the American Institute of Electrical Engineers in 1904 and has since been awarded to several great electrical engineers and scientists. Mr. Edison is a member—honorary in several instances—of a great number of societies, and though in no sense a club man, is an honorary member of the Engineers' Club of New York.

LIGHTING FIXTURE MEN MEET IN DETROIT NEXT WEEK.

Three Associations Will Be in Session at Same Time at Hotel Statler.

A novelty in conventions will be held at the Hotel Statler, Detroit, Feb. 9 to 13, inclusive, when the first annual lighting fixture market will be open while at the same time the conventions of three organizations of lighting fixture men will be in progress.

The National Council of Lighting Fixture Manufacturers, the Lighting Fixture Dealers' Society of America and the Illuminating Glass Guild will be the three co-operative trade associations holding their annual meetings, with Monday devoted to registration of delegates and meeting of executive committees in preparation for the actual convention sessions which will open on Tuesday with most of the sessions being joint ones of the three organizations. The fixture market will open Tuesday noon.

The opening session on Tuesday will be devoted to a discussion of cost accounting, while on Wednesday the manufacturers will discuss "Design Protection," following an address on this subject by Zell Roe, of Dodson & Rose, Chicago. On Thursday the manufacturers will take up the subject of standardization during which a discussion with part makers and glass manufacturers on the question of standardization of holders and holder screws and bushings will take place. Friday will be devoted to a general business session and election of officers by the three organizations.

The dealers' association will devote Wednesday to a discussion of future delivery prices on glass and fixtures. Questions of cost-keeping, ideas in marking and advantages in standardization will also be taken up. Thursday will be devoted to a discussion of "Why the Dealer Should and Should Not Manufacture," while on Friday the subjects will be "Advantage of Cartons for Packing Glass" and "The Jobber in the Fixture Field."

No evening sessions are planned for the joint conventions but a number of theater parties and other sort of entertainment have been arranged for the delegates.

INSPECTORS DISCUSS THEIR PROBLEMS AND CODE CHANGES.

A Report of the Closing Sessions of St. Louis Convention of Western Association of Electrical Inspectors.

The closing sessions at the fifteenth annual convention of the Western Association of Electrical Inspectors, held at the Planters Hotel, St. Louis, Jan. 27-29, partial report of which was given in last week's issue, were devoted to discussions of inspectors' problems, to committee reports and to several important papers on the program.

In a symposium on regulating the electrical appliance hazard, C. E. Michel, Union Electric Light & Power Co., St. Louis, said the central stations were as one unit in the effort to reduce fire hazards resulting from the use of appliances, and they recognized the desirability of co-operation of all interests concerned to prevent such hazards as well as instruct consumers in regard to them.

H. F. Strickland, Hydro-Electric Power Commission of Ontario, Toronto, spoke of the inspector's duty to protect life and property and outlined the results of laws passed in Canada prohibiting the manufacture and sale of key-socket devices of large capacity. He said the enforcement of the use of switching devices with inclosed live parts in Canada for the past five years has demonstrated the success of such practice. He was of the opinion that electrical fires could be reduced by education of the public as to the precautions necessary.

A paper on "The Responsibility of Public Service Company for Safe Wiring on Customer's Premises" was presented by John S. Leahy, St. Louis attorney. He gave a summary of the laws of negligence relating to such, and cited a number of decisions which had bearing on the subject. In the discussion, J. W. Kelly, Camden, N. J., brought up questions concerning inclusion of the National Electrical Code in city ordinances, Mr. Leahy replying that it should be done by inference only.

Revision of Code Rules.

The work of the Technical Subcommittee of the Electrical Committee of the National Fire Protection Association in revising the code rules on motor, motion-picture machine and garage wiring was outlined by F. A. Barron, General Electric Co., Schenectady, N. Y. When Rule 8, which relates to motor installations, was first drawn up, d-c. motors were commonly used, making installation a comparatively simple matter. Today the situation is different, a-c. motors being used to a much greater extent, sometimes with 200 to 300% overload on starting. This brings up the question of proper fusing and also of the size and capacity of the leads. It will be

Group of Delegates at Western Inspectors' Convention at St. Louis.

recommended that Rule 8 be rearranged, dividing it into three parts, viz.: first, rules relating to the protection of the motor itself; second, rules as to the minimum size of branch circuits and of mains; third, rules relating to the control of motors by suitable switches. It will also be recommended that parts of Rules 19 and 23 be changed and included in Rule 8, the purpose being to clarify the situation and bring the rules up to present practice.

Rule 42, on garage wiring, is considered fairly satisfactory, but some changes may be made as a result of the increased use of portable electrical devices in garages.

It will be recommended that the title of Rule 38A read: "Moving Picture Factories, Studios, Exchanges and Equipments," and to adopt the terminology of the Society of Motion Picture Engineers as to the names of the different types of machines. Other recommendations will be that No. 4 or larger will be used for wiring of the outlet for a projector; that when a motor-generator set is installed in the booth the commutator end be protected against mechanical injury by a wire screen; that switchboards used in theaters or similar places be of the dead-front type and made of noncombustible, nonabsorptive insulating material; that rewinding of films be done inside the booth or in a separate fireproof compartment.

Discussion on Inspectors' Problems.

Two sessions of the convention were devoted to consideration of problems met in the inspection field. Questions on numerous subjects were brought to the attention of the delegates and as a result there was general and extended discussion that yielded many points of information.

In discussing the use of light insulation (1/64 in.) wire on chain fixtures, it was found that some inspectors were passing it because some fixtures were so constructed that they did not allow the use of 1/32-in. insulated wire. The association passed a motion recommending that manufacturers be instructed to make their fixtures so that this practice be remedied. It was the sense of the convention that Rule 67*b* of the Code be rigidly enforced.

The use of externally operated enclosed switches in place of exposed knife switches came in for considerable discussion, with the result that the Association went on record as favoring the installation of such safety switches in all places where practicable. It was intimated that the revised Code would contain specific rules governing the use of enclosed switches.

The subject of inclosures for motors, especially in dusty places, was commented on quite freely, a number of the inspectors outlining the practice in their different communities. Enclosure, with sufficient ventilation, was generally recommended, but it was believed that the character of each installation determined the manner of housing. Attention was called to a booklet that the National Fire Protection Assocation is preparing, this booklet to give specifications for approved inclosures in different kinds of installations.

The differences of opinion in regard to what electrical equipment should be permitted in motion-picture-machine booths were aired. The Chicago practice, which permits of no other equipment besides the machine, rewind and film box, was generally favored.

In answer to the question, "Are refillable fuses of present types satisfactory?" a number of inspectors said their experience showed the refillable fuse of proper construction to be entirely satisfactory as to performance. Speaking for the manufacturers, A. L. Eustice, Economy Fuse & Manufacturing Co., Chicago, outlined the history of the development of renewable fuses and of the difficulties met in securing approval, and thanked the Association for the co-operation the members had given in this connection.

Considerable discussion was directed to the question of inserting the word "ungrounded" before the words "service wires" in the first sentence of Rule 24A of the Code, making it read the same as Rule 23A.

Grounding of transformer cases was thought to increase the hazard, it being the consensus of opinion that grounding of secondaries was sufficient.

Reports of Committees.

An amplified and revised table of conduit sizes for the installation of wires and cables was the principal part of the report of the Committee on Rubber-Covered Wire, presented by Chairman V. H. Tousley, Chicago. The new table gives minimum sizes of conduit for any number of conductors from 1 to 9 and sizes of conductor from No. 14 to 2,000,000 cir. mils. In cases where more than 9 wires are desired in a conduit, it was recommended that these wires not be permitted to carry a total current which would result in a greater copper loss than that occurring with the largest wire permitted in the particular size conduit under consideration. Investigation was made on the subject of marking wires to indicate their size, but the matter was referred back to the committee so it could be taken up for discussion with contractors' associations and wire manufacturers. Attention was called to the recent report of the Industry Conference which recommends the discontinuance of labeling No. 18 flexible fixture wire.

The report of the Committee on Demand-Factor, also presented by V. H. Tousley, brought out valuable data on size of wire for mains, submains and branch circuits. The report is printed in full on other pages of this issue.

The report of the Committee on Outside Wiring, made by F. W. Derby, Chicago, stated that Rules 12 and 85 of the Code are obsolete and insufficient, and that there are many conflicting laws and rules on outside electrical construction among the different states, municipalities and the federal government. It was suggested that the committee co-operate with the Bureau of Standards and other interested parties to formulate standard rules for outside construction.

The report of the Committee on Theater Wiring and Show Window Equipment, Frank L. Lucas, chairman, recommended that paragraph 1, Rule 38c, be changed to read: "Must be made of noncombustible, nonabsorptive insulating material, and where accessible from stage level must be of the dead-front type, to prevent accidental contact with live parts on the board and to comply with Rule 3."

The report of the Committee on Underground Systems, presented by Chairman F. F. Sengstock, Chicago, brought out data on duct and duct sizes, reasons for plugging vacant ducts, manholes and drainage, selection of cable, and installation of transformers.

The association passed a resolution creating a form of membership whereby manufacturers are enabled to join the organization.

The election of officers for the ensuing year resulted as follows: President, K. W. Adkins, Kansas City, Mo.; first vice-president, James Fenton, St. Louis; second vice-president, F. O. Evertz, Columbus, Ohio; secretary-treasurer, W. S. Boyd, Chicago; Executive Committee, F. G. Waldenfels, O. M. Frykman, A. O. Boniface, J. R. Morrissey, N. Rousseau and R. L. Daniel.

EXPECT FIGHT ON WATER-POWER BILL IN CONFERENCE.

House Members Are Against Senate Amendment Changing Plan of Compensation.

When the Senate and House conference committee meets to take up the water-power bill it is expected that a hot fight will take place before the reporting out of the bill for final adoption. The main struggle, it is expected, will come on the question of compensation for the use of water powers utilized by private capital, the Senate having made sweeping changes in this section of the bill over the original section adopted by the House.

The House bill originally provided "that the licensee shall pay to the United States reasonable annual charges in an amount to be fixed by the commission. When licenses are issued that contemplate the use of government dams or other structures owned by the United States, in the discretion of the commission the charges to be paid by the licensee may be adjusted at the end of 20 years after the beginning of operations and at periods of not less than 10 years thereafter, in a manner to be prescribed in each license.

The Senate amendment given in full herewith was lost by one vote in committee of the whole but when voted on again in the Senate proper was passed by a vote of 44 to 20.

The amendment as adopted reads as follows:

That the licensee shall pay for the license herein granted such reasonable annual charges as may be fixed by the commission, for the purpose of reimbursing the United States for the cost of administration of the Act in relation to water powers developed under its jurisdiction, in the proportion that the water power developed by the project covered by said license bears to the total water power developed by all projects licensed under the Act, and for that purpose such charges may be readjusted from time to time, not oftener than once in two years; the licensee shall also pay for the use and occupation of any public lands and lands in reservations, except tribal lands embraced within Indian reservations, necessary for the development of the project covered by the license such reasonable annual charges based upon the actual value of the Government lands used as may be fixed by the commission; but in no event shall the annual charge for the foregoing exceed 25 cents per developed horsepower: Provided, That when licenses are issued involving the use of Government dams or other structures owned by the United States or tribal lands embraced within Indian reservations the commission shall fix a reasonable annual charge for the use thereof, and such charges may be readjusted at the end of twenty years after the beginning of operations and at periods of not less than ten years thereafter in a manner to be described in each license.

The Senate committee changed the wording of the water-power bill in 58 instances, most of the changes being for the purpose of making the language of the bill clear.

Conference consideration of the bill is expected in a few days with Senators Jones of Washington, Nelson of Minnesota, Smoot of Utah, Bankhead of Alabama, Fall of New Mexico and Myers of Montana representing the Senate, and Representatives Esch of Wisconsin, Sinnott of Oregon, Haugen of Iowa, Sims of Tennessee, Taylor of Colorado and Lee of Georgia the House.

COMING CONVENTIONS.

National Council of Lighting Fixture Manufacturers. Annual convention, Detroit, Mich., Feb. 9-13. Secretary-treasurer, Charles H. Hofrichter, Cleveland, O.

Oklahoma Utilities Association. Annual convention, Oklahoma City, Feb. 10-13. Secretary, H. A. Lane, 611 State National Bank building, Oklahoma City.

American Institute of Electrical Engineers. Midwinter convention, New York City, Feb. 18-20. Secretary, F. L. Hutchinson, 33 West 39th street, New York City.

Central Electric Railway Association. Annual meeting, Louisville, Ky., Feb. 26-27. Secretary, A. L. Neereamer, Indianapolis, Ind.

American Electrochemical Society. Annual convention, Boston, Mass., April 7-10. Friday, April 9, joint session with American Institute of Electrical Engineers on "Electrically Produced Alloys." Secretary, Joseph W. Richards, Bethlehem, Pa.

American Association of Engineers. Annual convention, St. Louis, Mo., May 10 and 11. Headquarters, Planters Hotel. Secretary, C. E. Drayer, 63 East Adams street, Chicago.

National Electric Light Association. Annual convention, Pasadena, Cal., May 18-21. Headquarters, Hotel Huntington. Acting secretary, S. A. Sewall, 29 West 39th street, New York City.

National Association of Electrical Contractors and Dealers. Annual convention, Baltimore, Md., Oct. 6. Secretary, W. H. Morton, 110 West 40th street, New York City.

NEW YORK STATE ELECTRICAL CONTRACTORS MEET.

The annual meeting of the New York State Association of Electrical Contractors and Dealers was held at the Onondaga Hotel, Syracuse, N. Y., on Jan. 15. A report covering the progress of the National Association of Electrical Contractors and Dealers since the reorganization was made by W. H. Morton, general manager. The meeting was also addressed by C. L. Corbin, of the National Metal Molding Co., Pittsburgh, Pa., on "Market Conditions," and by J. A. Corcoran, of Schenectady, N. Y., on "Merchandising Methods for Electrical Retailers"; the latter lecture was illustrated by charts and diagrams. Other speakers also addressed the meeting, which was quite well attended.

Commercial Practice

Public Service Co. of Northern Illinois Has Unique Plan for Selling Stock— Points Fallacy of Government Ownership

NORTHERN ILLINOIS PUBLIC SERVICE OFFERS STOCK TO CUSTOMERS.

Company Will Sell Preferred Stock on $5 Down and $5 per Month Basis.

"Your boy—every boy—wants to grow up to be a business man of power and influence in the community." In that manner the Public Service Co. of Northern Illinois starts an advertising appeal to parents to give their children a share of preferred stock in the company that is now being sold to employes and customers on payments of $5 a month.

Gee!-now I'm a business man
YOUR boy—every boy—wants to grow up to be a business man of power and influence in the community. Ten or twenty years from now the boys and girls of today will be our most influential citizens—doing the work now on the shoulders of their fathers and mothers.
Give your boy or your girl a share of the Preferred Stock which we are now offering to customers and employes on payments of only $5.00 a month, so that now—in his youth—he may have the kind of financial and business training that will better prepare him for success later on.
Have Your Boy Make the Payments
$5.00 Down–$5.00 Per Month
as they come due every month. Give him the money, but let him handle the matter himself, getting the receipts and keeping them. He'll learn something of business this way—he'll learn what securities are—what dividends are—he'll take a personal interest in saving and investments. In later years this knowledge will be a decided advantage to him.
An Investment of Assured Safety
When you buy stock in the Public Service Company of Northern Illinois you know your investment is safe—it is your own home utility company—it is here for all the time, helping to develop the community—helping add to its prosperity. When your boys and girls have grown to manhood and womanhood the Public Service Company will serve them—and their children—just as it now serving you.
Buy a share of this safe, dependable stock for every member of your family on the easy terms now available to you. Not more than five shares, however, will be allotted to any one person on this easy payment plan.
Dividends at the rate of $6.00 per share will be paid on this stock from date of purchase. Price $100 per share as fixed by the Illinois Public Utilities Commission.
Inquiry Coupon
Date
Public Service Company of Northern Illinois
I would like to receive further information about the Public Service Company and the stock you offer on easy payments.
Name
Address
City
Give your boy or girl the right start. Act now. Call at our local office or at your bank for details.
Public Service Company of Northern Illinois

Effective Advertisement of Stock Sale to Customers of Utility on Easy-Payment Plan.

The company asks the parent to give the child the money to buy the stock but urges that he be allowed to handle the matter himself, paying in the money, getting the receipts and keeping them. By this method the child will learn something of business, what securities and dividends are and he will take a personal interest in savings and investments.

Dividends at the rate of $6 per share will be paid on this stock from the date of purchase. The price is par, $100 per share, as fixed by the Illinois Public Utilities Commission.

These constitute probably the most liberal terms ever offered to utility customers for purchase of stock. The sale is becoming quite popular and promises to be very successful.

DISCUSSES ECONOMIC FALLACY OF GOVERNMENT OWNERSHIP.

Chairman of Virginia Public Service Commission Points Out Failures.

George R. C. Wiles, chairman of the Public Service Commission of Virginia, in a recent speech said:

"Our utilities must render such service and furnish such facilities as will satisfy the public demand and at the same time be permitted to charge such rates and fares as will provide revenue sufficient not only to enable them to pay operating expenses, after making the due allowance for depletion and depreciation, but afford as well a return that make their stock and bonds attractive to the investing public to the end that additional capital may be obtained to make such extensions and improvements as the natural progress and development of our country will inevitably require.

"Our recent incursion into the field of government operation and control of railroads, telegraph and telephone lines has been sufficiently disappointing in its results to disclose the economic fallacy of such a policy generally inaugurated.

"The rapid strides in the industrial development of the vast resources of this country during the past quarter of a century have been mainly due to the rewards offered private capital for individual initiative, enterprise and energy. It has been clearly demonstrated that private ownership and operation is more efficient and economical and that the cost of the service rendered is more evenly and equitably distributed than under any possible form of governmental ownership or operation."

FEW MUNICIPALLY OWNED PLANTS.

Only two of the 34 third-class cities in Pennsylvania own municipal lighting plants, according to reports compiled by the state officials. The two cities are Meadville and Titusville, both in the western end of the state. Easton owns its electric light plant, wires, poles, etc., but buys its current on a meter.

WEST PENN SYSTEM INAUGURATES NEW TRAINING COURSE.

Gives Employes Instruction in Elementary Electricity at Trifling Cost.

Three women are among the 250 or more employes of the West Penn System, which operates railways and power plants serving territory in southwestern Pennsylvania, West Virginia and Ohio, who have enrolled in a correspondence course in elementary electricity inaugurated as part of the system's educational program for 1920.

The course, which was planned and is being supervised by Prof. C. B. Dennison of Carnegie Institute of Technology, Pittsburgh, consists of three short lessons a week, supplemented by lectures and class work at central points over the system. At the end of six months the students, at their present rate of progress, will have a thorough fundamental knowledge of electricity. This knowledge, it is reasoned, will spur some on to seek a further education along electrical lines. Means of doing their work more easily will be clear, the students equipped with the fund of information the course will give them, those in charge of the work believe, others will be in line for promtoion as a result and safety will be promoted.

The company bears practically all the expense of the course, although each student authorizes the deduction of $5 a month from his pay for two months when he enrolls. Upon completing the lessons, however, he receives a refund of $5 with his certificate.

ELECTRIC UTILITIES IN CALIFORNIA HAVE HUGE CAPACITY.

During 1918, 84 Plants Generated Enormous Total of 2,892,000,000 Kw-hrs.

Recent reports of the California Public Service Commission show that in 1918 there were 84 electric utilities in the state, operating 75 hydroelectric plants, with an installed capacity of 465,000 kw., and 50 steam plants with an installed capacity of 305,000 kw., making a total of 125 plants, aggregating 770,000 kw. During the year these plants generated a total of 2,892,000,000 kw-hrs., of which 2,163,000,000 kw-hrs., or 75% of the total, were produced from water power.

CONSERVATION AGENCIES PRAISED BY SECRETARY LANE.

Head of Interior Department Gives Credit to Work of Utility Companies.

Secretary of the Interior Franklin K. Lane, in his annual report to the President, in summing up the question of national fuel conservation, said:

"There are two agencies laboring incessantly in the true conservation of the sources of light, heat and power. These are the electric companies and the gas companies. Their whole plan and scope of operation is based in the most efficient extraction of power from its sources and its most economical distribution and application.

"They have grown up because they saved—saved coal and oil and labor and money for the people. By massing varied and multitudinous demands they have succeeded in concentrating production in great plants where inventive genius makes it possible for 2 or 3 lbs. of coal to produce the horsepower of energy once requiring 20 lbs.

"Not one person whom they serve out of every hundred understands or faintly appreciates the work which they are doing or its economic value to him."

PROGRESS IN ELECTRIC FURNACES.

Last year was a wonderful one in electric furnace progress, as in a period when business generally was going rather slow on new equipment, the number of installations more than doubled. More than one foundry has completely given over its foundry to electric melting. The electric furnace has not even begun to realize the possible applications in which some day it will be employed. The development of electricity as a lighting and power medium has been noted. Its development as the universal heating medium is about to come, this latter field of usefulness being the greatest of all three.

MUNICIPALITY TO ABANDON PLANT.

Voters of Eldon, Ia., have ratified a contract whereby the city will abandon its municipal electric power plant and buy current for the operation of its lighting system and other purposes from the Ottumwa, Ia., Railway & Light Co. When the voters found, that due to the efficient service, they could purchase power cheaper from the central station company than to continue producing it at the municipal plant, they decided in accordance with good business principles rather than from sentiment.

LARGE INCREASE IN ELECTRIC PUMPING IN WASHINGTON.

The Pacific Power & Light Co., Portland, Ore., serving a large territory in Oregon and Washington, for 1919 had an electric pumping load of 5000 hp. and will increase this to 6500 hp. in 1920. This phase of its service is for irrigation of farm and orchard tracts on the Columbia, Snake and Yakima rivers, in the vicinities of Pasco, Burbank, Kennewick and other points in Washington. Besides the pumping plants for this purpose on the streams, there are many installed for pumping water from wells and canals.

PACIFIC GAS & ELECTRIC EXPANDS.

Annual report of Pacific Gas & Electric Co. covering operations for last year will show large expansion in the activities of the company. For the 11 months to Nov. 30, 1919, the company added 43,942 customers to its books. Of this number, 10,764 were acquired through the purchase of the Northern California Power Co., taken over during the summer of 1919.

Operating Practice

Fuses for the Control Circuits of Feeder Regulators—How Modified Baffles and Air Supply Raised Boiler Efficiency

CONSIDERATIONS INVOLVING FUSING OF REGULATOR CONTROL.

Segregation of Fuses per Feeder or Elimination of Fuses Altogether Appears Safest Policy.

By H. R. Clarke.

With the four-wire, three-phase distribution system, giving 4000 volts between phases, delta pressure, for three-phase power supply and 2300 volts, or start pressure, between each phase and neutral or fourth conductor, it is customary to install a single-phase induction regulator for each phase. The lighting loads are picked up between the various phases and the neutral and are so distributed and apportioned that the three phases are approximately balanced. Each induction regulator is operated according to the load and length of the phase in which it is connected, so as to maintain the called-for voltage at the phase center, the center of gravity of the load or other specified location on the feeder. Ordinarily the induction regulator is controlled automatically in preference to hand control because of the closer voltage regulation possible with ever changing load and because by means of automatic operation one man is able to supervise any number of regulators, fifty or more, with ease.

Induction feeder regulators, when automatically operated, are controlled by a primary relay or contact-making voltmeter working through a potential and current transformer (and often a line-drop compensator) so that the voltage on the contact maker is proportional to that at the place on the feeder regulated for. The current passing through the current coil of the contact maker is likewise proportional to the current in the feeder. The fluxes of these two coils oppose each other so that when they balance, the voltage across the contact-maker potential coil is equivalent to that needed at the feeder. A line-drop compensator constitutes a phantom line wherein length, resistance and reactance are taken care of by introduction into the controlling circuit.

A secondary relay obtains its energy through the contact-making voltmeter as a very small current, and in turn energizes the induction motor operating the induction regulator. The regulator motor usually operates on 220 volts, three-phase, obtained from the station operating bus. As installed, each circuit, comprising three feeders and regulators, one per phase, is installed together and so arranged that each circuit cannot be mistaken for other circuits, although each phase of each circuit is actually treated as a separate piece of apparatus and feeder so far as concerns the lighting load and voltage regulation.

One company employing more than a hundred induction regulators adopted the policy of fusing the motor control circuits of the regulator motors on the idea that it is better to lose a fuse than to lose a motor. In order to simplify matters, this company installed one fuse per phase to every three circuits, which means nine regulators. The result was that one day when two fuses blew, nine regulators, hence nine distinct lighting feeders were made inoperative until the trouble had been located, remedied and the fuses renewed. The trouble occurred during the peak lighting load, when the voltage per feeder was at maximum. The lighting load gradually dropped, while the voltage remained high. Considerable damage to lamps was done and customers' bills for the period would be proportionally higher. Carelessness on the part of the station operator permitted this condition to continue until the following noon.

The whole trouble would not have occurred had (1) a main operating bus fuse been used instead of individual fuses for every three circuits; (2) the trouble would have been confined to only one feeder instead of to nine had one fuse per regulator been employed; (3) the trouble would have been insignificant, in any case, had the station operator made periodic inspection of his switchboard instruments to check up the current and voltage readings.

The point it is wished to emphasize here is that if automatic apparatus is to be installed, fuses should be used only where they can cause the least trouble by making automatic apparatus inoperative. If it is deemed necessary to employ fuses to protect regulator motors—and few companies have found it necessary—each motor should be fused, or at most one set of fuses for the three regulators of any one circuit. In this way trouble is localized. However, if some form of protection is to be employed, it would be better to use a small three-pole circuit-breaker in preference to fuses. If one fuse on a three-phase circuit blows, the motors will still be energized with single-phase energy; the motor will heat up as a single-phase motor cannot start up on single-phase energy, and overheating is to be expected if the regulators are called upon for much action.

The cost of individual circuit breakers, even one per three-phase circuit, is too high to warrant their installation. The consensus of opinion will be found to be that protection of regulator motor is not called for except through main fuses in the motor supply circuit controlling all regulators. The best form of protection is for the station operators to watch their instruments for abnormal occurrences. This and half-hourly or similar frequent inspections of equipment,

placing the hand on parts that might become hot, and fuses in the main circuit as a last resort, form the best safeguards.

BAFFLING AND AIR SUPPLY MODIFY BOILER EFFICIENCY.

Changing from Three to Four Baffles and Admitting Air Over Fire Increase Boiler Efficiency.

Two of the requirements that must almost invariably be met by central-station companies in their boiler rooms are that the boilers must be efficient and that their fires shall not smoke. Boiler efficiency is affected by the condition of the boiler heating surfaces, whether free from scale inside and soot outside, the velocity of the gases passing over the heating surfaces and the path they take, water circulation, etc. Some of these factors are always changing, for example, the condition of heating surfaces; and means can be provided for taking care of them by mechanical soot blowers, water treatment, etc. Some, however, as the path taken by the gases as they pass through the boiler are matters that once decided upon remain the same, except for unpreventable causes, such as fallen baffles, soot pockets, etc.

Some very extensive tests carried out by F. W. Dean, of the United States Shipping Board, and Henry Kreisinger, of the Bureau of Mines, on water-tube boilers for the Emergency Fleet Corporation were described at the recent annual meeting of the A. S. M. E. Two matters of special interest to stationary power-plant operators were brought out by these tests, one being the influence upon the definite boiler tested of changing from a three-pass baffling to a four-pass baffling; the other was the effect of introducing air over the fuel bed. The accompanying illustration shows the four-pass baffling and the method of introducing air over the fuel bed referred to in the paper.

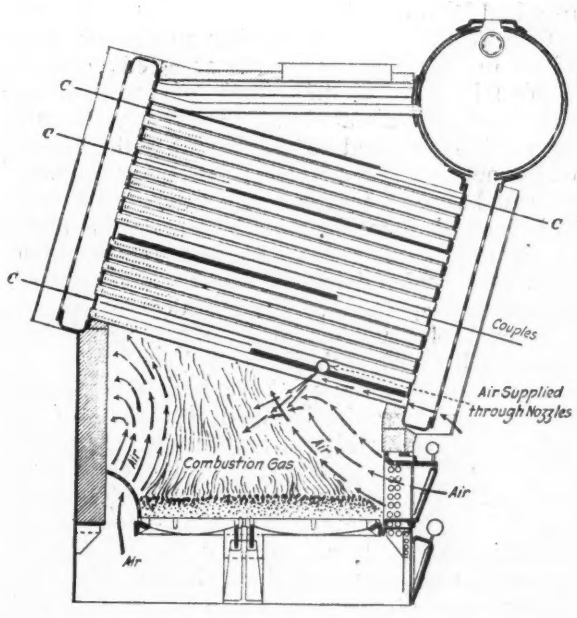
The boiler tested, and it was typical of about 2000 boilers ordered, contains 388 tubes of 3-in. outside diameter having 2518 sq. ft. of heating surface, with 7 ft. 7½ ins. of tube length exposed between headers. The furnace was 12 ft. wide, 6½ ft. deep and 3 ft. 8 ins. high at center. The grate had an area with the bridge wall of 67½ sq. ft., without bridge wall of 77½ sq. ft., the depth of grate being respectively 6 ft. 6 ins. and 5 ft. 8 ins. without and with the bridge wall.

The coal used was of low volatile content, high-fusing clinker from the Big View vein at Georges Creek Cumberland, a coal of uniform quality and size. The coal was fired by a Type "E" stoker. The grates were of the fixed type of double bars in two lengths and had ½-in. air and ½-in. iron spaces. Across the back end of the furnace there was a cast-iron bridge wall with narrow air spaces. This bridge wall was later found to have saved nearly 2% of coal, perceptibly diminished smoke, improved the gas analysis, saved the rear brickwork and reduced the time and labor of cleaning fires nearly 50%.

During the tests it was found that combustible gas was passing out of the furnace unburned or was being burned at the base of the stack, resulting in high stack temperatures or not, in either case wasting heat. As the need for more air was apparent, and better mixing of air also, it was decided to admit more air over the fuel bed in such manner as to bring about better mixing of air and furnace gases. This was done by drilling three ½-in. holes in the four firing doors (measuring 15 by 18 ins.). The first baffle, previously open about 3 ins. at the front, was closed up at the front and was extended at the rear to leave a gas passage measuring 36 ins. between end of baffle and rear water leg. The result of this was to draw the air coming into the furnace through the holes in the fire doors across the furnace toward the end of the baffle, facilitating mixing of air and gases. Wager's bridge wall was then installed to supply additional air to the rear part of the furnace proper.

With air supply admitted through the firing doors and bridge wall, the combustible gases rising from the fuel bed were squeezed between two air streams coming from different directions, and mixing was aided greatly. The direction of the air stream is shown by the arrows in the accompanying illustration. The total area for admission of air over the fuel bed was about 160 sq. ins., or approximately 2% of the grate area.

High stack temperatures, especially at the higher rates of combustion, suggested the wisdom



Four-Pass Water-Tube Boiler, Showing Facilities for Introducing Air Over Fuel Bed and Air Stream.

of changing from three to four baffles. By the addition of the iron bridge wall, admission of air over the fuel bed, lengthening and rearranging the baffles, the efficiency was increased from 60% to 72½%, based on dry coal.

[Changing from three to four baffles increases the resistance to gas flow and reduces the draft. The lowering of gas temperatures acts to still further reduce effective draft. In changing the baffling, it is important to make sure that the draft under the new conditions will be sufficient to assure ample fuel consumption at the maximum rate of combustion required. If this does not obtain, improved efficiency will be obtained by sacrifice of capacity.—EDITOR.]

Contractor-Dealer

Satisfied Customer Is Dealer's Best Advertisement—Value of Featuring Single Article in Window—About Competition

DEALER INCREASES SALES BY SATISFYING HIS CUSTOMERS.

Interest and Courtesy to Old Customers Brings Dealer Fresh Trade and Advertising.

By H. A. Smith.

It is a recognized fact that in retail business a satisfied customer is the biggest advertisement a dealer can acquire. Whenever a certain store is mentioned in a gathering of men or women, that store will receive its knocks or its boosts according to the treatment received by one or more of those present. Moreover, one false step, one discourteous action is never forgotten, and the customer's friends, as well as she herself go to the little shop across the street.

I know many men who have never entered certain restaurants again after having been rudely treated at a single meal, even if service before had been excellent.

One afternoon I was passing an electric shop with a married sister when she accosted a friend. I stood idly by, as the subject of conversation was something about dress. However, the talk soon drifted around to the fact that the friend was about to enter the electric shop for the purpose of buying a toaster. My sister, it appears, had received discourteous treatment in this place at one time or another and as a result we went to another dealer down the street and purchased the desired appliance. Each dealer can therefore probably subtract at least two customers from his list with each dissatisfied one.

For some time now I have been the student of some undesigned advertising in behalf of an unknowing dealer who, it appears, is very polite and attentive to customers. A rather close relative one day bought a well known and efficient type of vacuum cleaner carried by the shop of a rising dealer. One morning the relative in question was operating her cleaner over the dining-room floor when a friend entered and watched the action of the machine and finally asked permission to work it herself. The result was that she fell in love with the cleaner and together they went to the dealer's shop to look at them. The outcome was a sale for a dealer who gave prompt and individual attention to a customer's wants.

By actual count my relative has acted as an uninterested saleswoman, selling no less than eight machines to relatives and friends, each of whom has acted in the same way and sold almost as many more apiece.

Multiply the initial customer by a possible hundred and one can readily figure the results of giving satisfaction by courteous treatment, individual attention, service and a good machine.

Any woman customer does for any business an infinite amount of good or an infinite amount of harm. Conversation goes from mouth to mouth and place to place and according to its character helps or hurts trade. It is up to the dealer to make each reference to his store a trade bringer.

Again, why not cultivate the fresh trade of past customers? Mrs. Smith or Mrs. Brown is equal to one customer each time she comes back. For instance, if Mrs. B. comes back five times she is equal to five customers. Why spend all the time looking for brand new trade? Make your place so well liked that each buyer becomes a customer, and make it a business to keep all customers. Have repairs up to the minute, have someone to look after complaints, don't let a customer ask Miss So-and-so and get a reply something like this, "Well, I don't know; you'd better ask Mr. J." Perhaps Mr. J. knows, perhaps he doesn't. The best method is to have all your assistants know all about everything. This, however, is not always possible. Then it is best to designate someone who should make it his business to be informed well enough to be able to take care of all complaints.

Establish a policy, live up to that policy, and take for its basis the desire and ability to give absolute and complete satisfaction at all times.

FEATURING A SINGLE SPECIALTY.

Avoid Confusion in Minds of Prospective Customer by Displaying One Article at a Time.

Too often the electrical dealer confuses the mind of the householder by the multiplicity of household appliances he offers. Much as the average housewife and her good man would like to have everything electrical, the family purse does not permit it—at least, all at once—and when they gaze into a window and see the percolators and toasters, grills and chafing dishes, hot water heaters and hair curlers, no definite impression is left on the mind. Instead, it would be better to feature a single commodity and play this up intensively, both in their newspaper advertising and window display. The main thing is to get the family interested and induce them to purchase *one* electric device. After they have tried that and seen how convenient it is, the selling of the second and third appliance will be made with half the effort. It is well to start with one of the more popular priced conveniences, such as the electric toaster. No better example of a publicity campaign along these lines could be mentioned than that of the Brooklyn Edison Co., of Brooklyn, N. Y., whose advertisement at once visualized the delights of

having an electric toaster at one's elbow when breakfast is served:

PERFECT TOAST

Every Day in the Year.

You can be sure of having hot, appetizing toast for breakfast every morning if you have an Electric Toaster on your table.

With the toaster right at your elbow, you can make sure that each piece is warmed to an even, golden color, and serve it while it is crisp and piping hot.

The pleasure and convenience you would derive from an Electric Toaster is worth many times its small cost. You can purchase one at our Electric Shop.

BROOKLYN EDISON CO.

Then they had an Electric Toaster Sale, which lasted for a month, during which time they made a special price on this device, and also advised that it could be purchased on the time payment plan if desired.

They arranged a special toaster window to back up their advertising campaign. Suspended from the ceiling, at a height where it would most readily strike the eye, they suspended a large card:

ELECTRIC TOASTER SALE

$5.55. $2.55 down, and the balance of $3.00 with next bill. Crisp, brown, piping hot toast.

Another card fastened to the side wall said "Edison January Toaster Sale," and then proceeded to quote the special offer on toasters. At the opposite side of the display was a low, glass topped table, on which was an electric table lamp, a toaster, and a plate of crisp brown toast. A long white ribbon ran from the card on one side to the toaster on the other, linking them most effectively in the mind of the beholder. Several other tables also held lamps, toasters and slices of toast, and several of the toasters with cords were displayed on the floor close to the glass. Scattered about the window were a number of small catchy cards—buff, lettered in red—"Toast perfectly made is toast electrically made," "Prepare your morning toast on the dining room table," "Any lamp socket supplies the current," "An electric toaster prepares a slice in a minute," "Varied uses of the electric toaster—It is recognized as a breakfast food, but it also has its place as a sickroom food, after theatre supper, or luncheon," "Electric toast is made right in the dining room table with little trouble," "With little effort the electric toaster will prepare 15 slices of delicious brown toast for one cent's worth of electricity—and it is sure to be hot." These pithy cards, just the arguments that an expert salesman would use, played a large part in securing many sales of the toaster.

The window was of the open back variety, permitting a full view of the interior of the store with its cheerful array of lamps and electric devices. Here, too, on Saturday afternoons of each week during the sale a demonstrator prepared delicious toast, which was served hot to all visitors. Cards were sent to all the patrons of the electric company, inviting them to come down and learn the advantage and convenience of the electric toaster and try some of the toast prepared on same.

Efforts being concentrated on the sale of toasters, a large number of them were placed during the month, and each purchaser became a candidate for further electric appliances. In fact, the sale of a percolator became a much easier matter as the campaign was directed especially at those who were known to have electricity in their homes and already possessed an electric toaster. This list of possibilities did not need to be educated as to the advantage and convenience of electricity as a fuel, but merely had to be "shown" that coffee prepared on an electric peroclator surpassed in deliciousness and food value that prepared in any other manner. It was the same way when a chafing dish, or electric grill, or waffle iron sale was launched. The list of users of electric appliances formed the basis of each new campaign, though, of course, general advertising was not neglected, since many who had not purchased a toaster might be attracted to the advantages of a chafing dish or a percolator.

Simple but Effective Single Specialty Window Display.

OFFSETTING DEPARTMENT STORE ELECTRICAL COMPETITION.

By I. R. Merritt.

What can the electrical dealer do to combat the competition resulting from the sales of electrical appliances by department stores, druggists and hardware and furniture merchants?

One satisfactory solution to this problem which electrical dealers and contractors are constantly up against was supplied by the Frank Adam Electrical Co., St. Louis, Mo., who advertised as follows:

"Satisfactory results with electrical appliances and electrical repairs can only be obtained through dealing with electrical people who know the business."

A little sketch at the top of the advertisement depicted a man about to enter an electrical store. Overhanging the door was a sign on which was inscribed: "A Live Electrical Shop."

It is only by educating people to patronize the exclusive electrical shop and then continuing to merit that patronage by better service that the electrical dealer can successfully meet the competition from merchants in other lines of business.

BOOK REVIEWS

"Governors and the Governing of Prime Movers." By W. Trinks. New York: D. Van Nostrand Co. Cloth, 236 pages (6 by 8¾), profusely illustrated. Supplied by the Electrical Review Publishing Co., Inc., for $3.50.

The aim of the author has been to produce a book that would impart a knowledge of governors for prime movers in easily get-at-able form. There are a vast number of different types of governors for a vast number of different forms of prime movers, and information of these governors, the theory upon which they work, how their working can be predetermined and how governors can be designed has in the most part been lacking, and what has existed has been hard to find.

The author in his book has taken up the essentials and principles of governing, to do which he has wisely first taken up prime mover operation and the purpose of and the conditions under which a governor will be called upon to function. The book contains fifteen chapters, each dealing with the following phases of governing: General statements, the direct-control governor as a motor, the centrifugal governor as a measuring instrument (speed counter), promptness and traversing time, adjustment of equilibrium, speed, shaft governors, natural period of vibration of governors, effects of outside forces impressed upon governors, interaction between governor and prime mover, discarded types of speed governors, rate-of-flow governors, pressure governers, relay governing, governor troubles and their remedies, self-regulating features of prime movers. The book closes with an admirable appendix, biography and an index. A commendable innovation carried out in the book is to enclose in a pocket in the rear cover a loose card upon which has been printed a list of symbols employed in the text, a refinement that saves much time and trouble.

The book has been well written, the matter having been handled by the author in a way that shows him to be a master of his subject. The text and general arrangement of the pages is most pleasing. The diagrams, of which there are a great many, are bold and clear and admirably enable to be visualized the principles they represent. In looking through the book one is surprised that so little mathematics has been used, and realizes that mathematics is after all only a means to an end.

In reading the book one feels more as one listening to a discourse, rather than reading a book, to such an extent has the author brought to bear upon his book the personality he exerts in the classroom. To read the book is to bring realization of the fact that governing is not after all the dry subject one naturally presupposes it to be. And one closes the book feeling that one has learned much and learned it easily. And the knowledge gained should be of immense value, not to students of mechanical engineering alone, but to every operator and designer of prime movers, every operating engineer concerned with the parallel operation and the interconnection of systems, and to everyone who wants to know how and why governors work, why some never work and why some work only sometimes.

"The Construction of Graphical Charts." By John B. Peddle. New York: McGraw-Hill Book Co., Inc. Cloth, 158 pages (6 by 9 ins.), 79 charts. Supplied by the Electrical Review Publishing Co., Inc., for $2.

This book when first published was the first of its kind in the English language. That it met a need of the practicing engineers is evidenced by the necessity of a second edition.

Much of the work of the designing engineer consists in the repeated application of a limited number of formulas to similar problems of different constants. It is evident that any mechanical means for performing these calculations will greatly expedite the work as well as lessen the chances of error. The calculating chart is one of the means of saving time and mental wear in repeatedly making similar calculations or in evaluating similar equations for new constants.

In the book before me the theory, process of making and of using a great variety of calculating charts is explained. While the illustrative charts are mainly selected from the mechanical and structural fields, the electrical engineer should find no difficulty in adapting the principles to his particular needs.

The new edition of the book is improved by the addition of a chapter describing a new and ingenious method of constructing alinement charts. This is based on a few simple principles of determinants. These the author explains with sufficient detail to enable anyone not familiar with them to use the method. This is a distinct contribution to chart making.

The book should be of great value to any one who must repeatedly make similar calculations.

C. M. JANSKY.

DEMAND FOR ELECTRICAL APPLIANCES EXHAUSTS STOCKS.

Electric appliance dealers of Louisville, Ky., reported an increase of more than 100% in sales during the preholiday season just passed compared with 1918—the best previous record. The only thing which prevented the sales being even larger was the fact that the stocks of many of the most popular appliances were completely exhausted. Each Christmas for the past three years has broken records in appliance sales, and this great increase in the popularity of electric appliances has encouraged even department, hardware, drug and various other business houses to feature electrical things, so that during this holiday season there were over 35 different stores handling various kinds of electric household appliances.

EXPOSITION DATE ADVANCED.

The National Exposition of American Manufacturers which was to have been held in April, 1920, at Buenos Aires, Argentine Republic, has been postponed until November, 1920, to allow more time for adequate preparations and shipments from America.

New Appliances

Rocking Washer — Compact A.-C. Instruments — Metal Melter—Outdoor Foot Warmer—Hospital Call Switch

Wayne Washer Features Rocker Action.

The Wayne Manufacturing Co. of St. Louis, Mo., has announced the new "Wayne Rocker," an electrically driven rocker type washing machine, which is being placed on the market.

The Wayne Rocker is constructed on the rocker principle for the following reasons: In the dolly type the pegs hold the clothes and swing them back and forth through the water. In the vacuum type the clothes and water are agitated by the action of the plunger. In the cylinder type the revolving of the cylinder in the tub carries the clothes out of the water on hazards or projections of various types and drops them back into the water. In the rocker type the action of the tub agitates the water, forcing it through the clothes. No projections are necessary and thus the danger of injuring delicate fabrics is minimized.

Wayne Rocker Aims at Simplicity of Construction.

Simplicity has been one of the aims of Wayne construction. There are but seventeen moving parts, all the bearings of which are oilless. By this means the danger of neglect and consequent scarred and cut bearings—and the attendant general break down of the machine—are eliminated. Furthermore, the copper or galvanized tub is not fastened to the machine by any bolts or rivets, but merely rests in the rocker cradle, thus aiding in prolonging the life of the machine. The tub can be easily removed, opening the inside of the cabinet for cleaning.

In construction the Wayne Rocker appears to be strong and well made. The frame is of channnel and angle steel, welded—not bolted. The panels are of sheet steel japanned and the tub is of copper, tinned on the inside. The wringer features simple control, swinging to various positions; is reversible and is equipped with a quick release device. Square and compact of appearance this machine promises to be a live competitor in the washing machine industry.

Roller-Smith Introduces New Imp Type Instruments.

The Roller-Smith Co., 233 Broadway, New York, is offering to the electrical industry in answer to the growing demand for smaller A. C. instruments, two new types which exactly correspond in size and dimensions to the D. C. Junior and 4-inch Imp types made by this company.

Jr. Imp. A. C. Voltmeter, Base Flange Model.

These new A. C. instruments are particularly desirable in connection with battery charging outfits, laboratories, current rectifiers, motor-generator sets, electro-medical, electro-therapeutic, and electro-dental apparatus, small switchboards, fire and signal systems, wireless or radio sets and other similar applications.

Four-Inch Imp A. C. Single Phase and D. C. Wattmeter.

It is frequently desired to mount small A. C. and small D. C. instruments on the same panel of a switchboard, as, for instance, with A. C.-D. C. motor generator battery charging outfits. In this case both types of instruments should be similar.

In addition to the A. C. Ammeters and voltmeters, the Roller-Smith Co. has introduced a line of 4-inch Imp type A. C. single phase and D. C. wattmeters which match in appearance the Imp type ammeters and voltmeters although their cases necessarily have a greater depth.

Electric Metal Melter of the Bench Type With Automatic Regulation.

The General Electric Co. has developed a new electrically operated device for melting lead, babbit and similar metals, known as the 25-lb. bench-type electric metal melter, which is designed to eliminate the loss of time and material, and the risks of losses by fire, accidents, etc., which attend the melting of metals in haphazard containers with a gasoline torch to supply the heat.

Electric Metal-Melting Pot for Babbitt, Lead and Similar Metals.

This new pot is of very solid, durable construction, having four short legs on the bottom and a flange on the upper rim, so that it may either be stood on a table or the floor without fear of upsetting, or lowered into a hole so as to be flush with the top of the table. It is fitted with a connecting core and plug that can be attached to any electric light circuit.

The heating element is a coil wound around the container from top to bottom and thoroughly insulated from the outside, thus insuring an even distribution of heat through the contents

of the pot, and preventing temperature loss due to radiation.

The automatic regulation, which is the principal feature of the device, has been obtained by constructing the heating element of wire which has a positive temperature co-efficient. That is to say, when the temperature of the heating element rises, its resistance rises proportionally, thus limiting the current and consequently the heat. When cold metal is put into the container the initial rise of current is enough to melt it quickly, but after it is melted the current is automatically reduced to just enough to keep it molten, but not enough to burn it. This does away with the thick scum of oxidized metal around the top, which was a prominent feature of the old method.

It also permits the operator to go away and leave the pot to itself when necessary without fear of wasting good metal through too much heat, or setting something on fire. With the gasoline torch, the operator had the single alternative of turning down the flame to a safe degree, which usually meant that the metal solidified and had to be melted all over again.

Due to its solid construction, automatic regulation, and safety features, this electric melting pot is an invaluable aid to those who see the necessity of doing away with the wasteful, inefficient and dangerous methods which have hitherto been in force.

Outdoor Service Foot Warmer.

An electric foot warmer made by the Westinghouse Electric & Manufacturing Co., and designed for outdoor service in winter weather makes it possible to greatly relieve outdoor workers who are obliged to remain in one spot for long periods of time, from the discomfort of cold feet. Investigation as to how this relief could be furnished by means of an electric heater resulted in the development of an electric foot-warmer different from anything previously on the market.

Foot Warmer Which Adds Comfort to Outdoor Work.

It appears simple and rugged in construction and is absolutely waterproof. It is made in one piece and the top surface is diamond treaded. Feet are provided at the corners to raise the device one inch above the floor or ground.

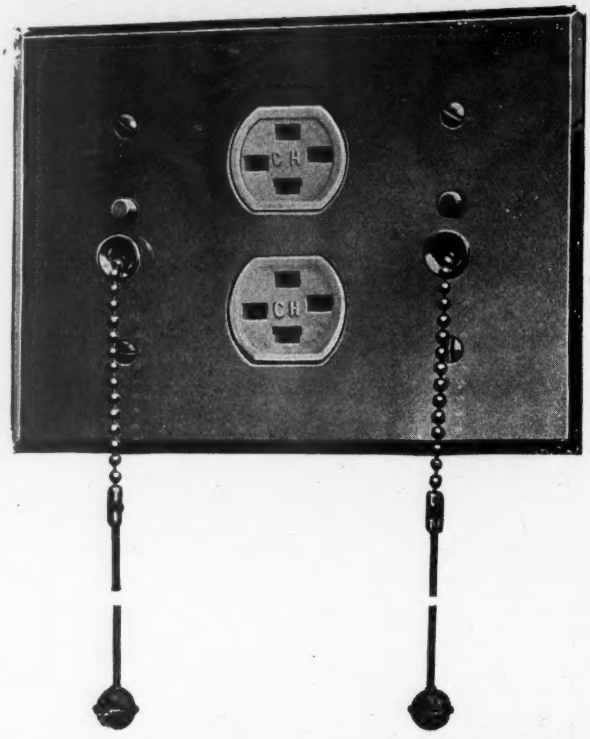
The warmer is manufactured in two sizes, one of which, measuring 14 ins. wide, 20 ins. long, and 3½ ins. high, is made either of cast iron or brass. This style is provided with a three-heat snap switch by which three-heat operation can be obtained. The amount of power consumed can be regulated to 200, 100 and 50 watts, respectively, at 120 volts, for the different positions of the switch. This size can also be operated on 240-volt service and rated at 200 watts single heat. The smaller type, 12 ins. wide, 16 ins. long and 3½ ins. high, is rated at 200 watts and 120 volts single heat. Six feet of cord with a snap switch is supplied with each warmer. The rubber-insulated cable enters the device through a bell-mouthed waterproof fitting mounted in the middle of one end.

The heater unit is clamped against the under side of the main casting by a sheet-steel clamping plate ⅛-in. thick, and a bottom sheet-steel plate sealed with a waterproof gum covers the heating element. The resistance which constitutes the main element of the heater, is of the slotted ribbon type distributed uniformly over the entire surface. The ribbons are assembled between two plates of built-up mica .025 in. thick, cemented together to form a unit.

The number of applications of the foot warmer is enormous, a few are given in the following list: Gatemen at railway stations, crow's nests aboard battleships, sentrymen aboard passenger ships, footmen on duty at clubs, watchmen at large industrial plants, traffic policemen, men on duty at bridges and piers, drawbridge operators and guards, outdoor service men at camps and cantonments, and service men at hotels and large restaurants.

C-H Duplex Hospital Call Switch with Duplex Receptacle.

A hospital call switch recently developed and put on the market by the Cutler-Hammer Manufacturing Co. of Milwaukee, Wis, has met with so great a demand that a duplex switch of this same type has also been designed. This new switch consists of two single call switches, one located on each side of a duplex receptacle with one brass plate covering all and in many cases it has been found cheaper and more convenient than installing single switches and receptacles throughout the hospital ward. This switch combination adds much to the convenience of the patients.



Duplex Hospital Call Switch Showing Off Buttons and Receptacles.

The switch is mounted flush, in the wall between beds, the patient on either side of the switch using the nearest call switch to signal the nurse. The receptacles provide convenient electrical outlets to plug in bed lamps, heating pads, etc. Each call switch has a pull chain with a linen cord extension and an "off" button which protrudes through the switch plate. To call the nurse the patient gives a slight pull on the cord, which operates the signal in the utility room or at the head nurse's desk, and causes the "off" button on the switch to project farther from the plate. The signal remains in operation until the nurse or other attendant answers the call, since the only way to cancel the signal is to depress the "off" button on the switch. The protruding button also serves the purpose of indicating to the attendant which patient called.

The switch is silent in operation and contains no exposed live parts whereby the patient or attendant would be liable to electric shock. Each call switch, as well as the duplex receptacle, fits any standard wall outlet box, and may be used on any circuit of 125 volts or less. Each receptacle has a maximum rating of 250 volts, 10 amperes.

Trade Activities

Cutler-Hammer Leases Chicago Headquarters—Landers, Frary & Clark Make Extensions—Rome Wire's Aid Room

Landers, Frary & Clark, New Britain, Conn., made the largest extensions of any factory in New Britain during 1919. During the year the directors recommended an increase of capital from $5,000,000 to $6,000,000 for the development of new lines of manufacturing, details of which have not been announced. On Dec. 23, last, the company acquired the Barnes & Kobert Manufacturing company's plant, in New Britain. At the present time the company is building a large factory addition to the East Main street plant. President A. G. Kimball of Landers, Frary & Clark, sees a rush of business for 1920. Production, now compared with war-time, is about on the same scale. Much of the machinery formerly used on government work is now being used in commercial lines. The company now employes about 2300 people, which is about 500 more than during war-time. The directors declared a dividend of 6 per cent in June and one of 4 per cent in December, 1920.

Cutler-Hammer Manufacturing Co., Milwaukee, has leased the five story building at 317-323 North Michigan avenue, Chicago, for a period of 10 years at an annual rental of $18,000. The building is on the east side of the street, between South Water street and the Chicago river, and is one of the buildings that was cut in half by the widening of Michigan avenue to connect up the Chicago boulevard system. The property fronts 80 feet on Michigan avenue with a depth of 63½ feet, and has a 20-foot alley on the south, and a 40-foot alley on the east side, so that each floor will have 5000 square feet of floor space with light on three sides. As Michigan avenue will have two levels to approach the new bridge across the Chicago river, there will be stores on both the upper and lower levels. The Cutler-Hammer Co. will occupy the first two office floors and basement and will sublease the stores and balance of the building.

Rome Wire Company, Rome, N. Y., has established a well-equipped first aid room in their plant for the benefit of their employes. In addition a first aid class has been formed with the view of having some one in each department conversant with a knowledge of what to do in case of accident. Foremen instruct their men to visit the first aid room for the care of the slightest cut and abrasion in order to eliminate infection. With a view of promoting social hygiene, talks to groups of girls on the subject have been given throughout the mill, and literature dealing with it has been distributed. Prenatal care, baby welfare, hygiene and sanitation are taught in homes when found necessary.

E. C. Atkins & Co., Indianapolis, Ind., saws, saw tools, and mill specialties, have just issued a handsomely bound 264 page price list and a catalogue, containing not only description and prices of all articles manufactured by the company, but also the Atkins telegraph code and other information. The Atkins family have been making saws for about 300 years. During this period, from one generation to another, they have actually followed the growth of the saw from its most primitive type to its present state of development. In addition to saws for every branch of work the Atkins company has branch houses in various parts of the United States and Canada, where repair work can be done. The company also calls attention to its equipment and facilities for the manufacture of special articles in sheet metal work of any kind.

Morse Chain Co., Ithaca, N. Y., through President Frank L. Morse, announced on Jan. 1, last, that the company has given each of the 670 employes a New Year's present in the form of an annual dividend on his wages, averaged as if invested in the company's business at the same rate as drawn by the stockholders in the company's investment. The company will also establish a fund for the purpose of installing a service store in the new service building to be erected by the corporation, where all employes may purchase goods at cost, as well as patronize a cost service cafeteria.

Booth Electric Furnace Co., Chicago, has opened branch offices at 805 Hammond building, Detroit, Mich., in charge of A. M. Beltaire, and in the Brown & Marx building, Birmingham, Ala., in charge of Gassman & Cunningham. The company also reports the sale of 20 Booth rotating electric brass furnaces, which includes a number of repeat orders. These orders cover all four sizes from 250 to 2000 pounds. Announcement is also made of the sale of a 2-ton Booth two phase steel melting furnace to the Cincinnati Steel Castings Co., Cincinnati, O.

Electrical Engineers Equipment Co., Chicago, manufacturer of high-tension line and station equipment, whose offices were destroyed by fire several weeks ago, established permanent offices at 35-37 South Desplaines street, Chicago. The factory, which escaped fire loss and is running at full capacity, remains at its old address, 715 West Meridian street, about a block from the new offices. The company issued a complete bulletin describing over 100 different switching and protective combinations.

Dayton-Dowd Co., Quincy, Ill., is sending out several pieces of new literature on its centrifugal pumps. Bulletin No. 241, comprising eight pages, illustrates and describes Type CSU automatically balanced multi-stage pumps, which are especially adapted for boiler feed, colliery and mine station pumping service, elevator and hydraulic pressure, municipal water works, etc. Because of its compact, simple and rugged construction, its high permanent efficiency and the ease with which it may be operated and maintained, this type is being widely adopted for all classes of high-pressure service where economy and reliability are factors. Another bulletin, No. 242, treats with Type SS single-stage, single-suction centrifugal pumps, adapted to general pumping service, where the total head does not exceed 120 ft. It contains specifications for this type of pump and gives details concerning its construction and operation. A third bulletin designated as No. 240 has for its subject Type CS single-stage, double-suction volute centrifugal pumps, and enters into a detailed description of its construction and operation and clearly sets forth the advantages afforded by this particular unit. It is profusely illustrated and shows characteristics of several sizes of Dayton-Dowd pumps, which have been made from data resulting from regular shop tests to which all pumps are subjected before shipment. A table showing the capacity, speed and efficiency of Type CS single-stage, double-suction pumps as well as other useful information is included.

Wolcott Manufacturing Co., Hartford, Conn., has issued an eight-page booklet of timely interest entitled "Who'll Help Electrify 7,070,707 Dishpans?" and carries special reference to the Mermaid electric dishwasher which it produces. Heretofore this labor-saving device has gained little recognition but with the present acute servant problem a vast market awaits the electric dishwasher and is a field that the distributor of electrical appliances would do well to cultivate. According to the booklet, four big markets are open to the electric dish washer, namely: 7,070,707 homes; boarding houses, tea-rooms, industrial plant restaurants, small clubs, fraternity houses and boarding schools; physicians, domestic scientists, and all who value home sanitation, and architects, builders and owners anxious to increase the value, the salability or rentability of dwellings and apartments. The Mermaid dish-washer described in the publication, is a thor-

oughly practical and sturdy machine that washes, rinses and dries all dishes and ordinary kitchen utensils at a very low cost.

Combustion Engineering Corp., 11 Broadway, New York City, has enlarged its facilities for handling business in the Philadelphia territory. The office of the company in this territory is located in the Lincoln building, and W. C. Stripe, formerly of its Pittsburgh office and formerly of the Westinghouse Electric & Manufacturing Co., becomes manager of the Philadelphia district. Associated with him in that territory on the active selling force are C. L. Bachman, recently from active military service abroad and formerly manager of the Chicago office of the Combustion Engineering Corp. before the war, and E. F. Kuehnle, formerly of the main office in New York. This enables the Combustion Engineering Corp. to give increased service to plants that are in any way interested in meeting the present fuel situation by applying any one of the several types of stokers that are manufactured by this company, as may best suit their conditions. Among the more prominent and popular types of stoker manufactured by the company are the Type E stokers which are underfeed stokers, designed for use with bituminous coal where heavy loads are required; the Type K stoker, designed for use with bituminous coal where moderate loads are required on small boilers, and the Coxe stoker, which is designed to burn any kind of low grade, high ash coal, such as high ash bituminous, anthracite, screenings, or coke breeze. This corporation also manufactures the Grieve grate which is designed for any plant burning either bituminous or anthracite coal that for any reason may not install automatic stokers. The Combustion Engineering Corp. follows the policy of broadly covering the field with various stokers to best meet the conditions prevailing in any power plant, rather than trying to adapt one type of stoker to meet all conditions.

Hurley Machine Co., Chicago, has issued the first number of the "Hurley Message," their new house organ. The purpose of this publication is to help the dealer. The immediate desire however, is to impress upon trade, the tremendously increased facilities which are being developed by the Hurley company in an effort to double their output. A new factory will be added to the three plants already in existence, this spring, materially increasing the output. In the "Hurley Message," it is planned to bring out a considerable amount of educational copy which will instruct the dealer on a lot of the principles of washing, cleaning and ironing, and assist him in making a more interesting talk to his customers. The increasing output of the Hurley plants is a big indication of the general advance in the sale of washing machines. The third plant erected by the Hurley Machine Co. has just been completed, and still the demand is not decreased.

Essington Works of the Westinghouse Electric & Manufacturing Co., at Lester, Pa., near Philadelphia, is the scene of a $5,000,000 development consisting of 4 new buildings to be added to the group of 7 already existing. Westinghouse, Church, Kerr & Co., Inc., New York, have been awarded the contract. The new buildings will consist of a machine shop for large work, to measure 130 by 750 ft., and to include a balcony. It will be a duplicate of machine shop No. 1, and will be known as machine shop No. 3. The other buildings are an addition to the erecting shop to measure 130 by 300 ft., with balcony; a warehouse 40 to 600 ft., to be 3-stories high, the upper floor to be used for light machine work, and a light machine shop, one story high, to measure 130 by 500 ft.

Westinghouse Electric & Manufacturing Co. announces that the Merchant Shipbuilding Corp. has awarded it the contracts for the propelling machinery for two new ships being built at the corporation's Chester, Pa., yards for the Shawmut Steamship Co. These ships, which are designed for general cargo service, will be of about 10,000 tons dead weight, and are to have a speed of 13 knots. Propelling equipment of each will consist of a 4200-hp. cross-compound Westinghouse turbine, of the latest type, which will drive the single propeller through double-reduction gears. An oil-relay governor will be provided which will prevent the propeller from racing, even in heavy seas, but will at no time shut the turbines down. As there will be two separate turbines, high pressure and low pressure, and either can be operated independently in an emergency, the danger of crippling the ship by an accident to the machinery is very remote. The gears are to be of the floating-frame type, which automatically keep in exact alinement in spite of errors or changes in adjustment that would be disastrous to rigid gears. The main condensing equipment will be of Westinghouse make, including the condensers, Leblanc air ejectors and condensate pumps. The entire propelling system will be highly efficient and especially economical in fuel consumption. There are now in commission, or being built, over 250 ships with Westinghouse geared turbines and among them are several operated by the Shawmut Steamship Co.

Edison Electric Appliance Co., Inc., 5660 West Taylor street, Chicago, is sending to Hotpoint dealers price list No. 17, showing price changes effective Jan. 12. In its letter to the trade the company states that "the continually rising costs are due to the difficulty in keeping a consistent supply of materials on hand at fixed prices, and because of the ever-changing conditions where labor is concerned." In view of the situation generally it urges that dealers place their orders for future delivery with their jobbers now. The company is also sending to dealers a reproduction of the Hotpoint advertisement appearing in the Jan. 24 issue of the *Saturday Evening Post,* which is a part of the national advertising campaign that is being conducted, stimulating the large demand for Hotpoint appliances. This advertisement features the Hotpoint Hedlite heater and depicts the comfort and convenience afforded by this device.

Fairfield Manufacturing Co., Lafayette, Ind., has been organized to manufacture differential and bevel gears for automobiles. The officers of the new company, all of whom are prominent in the Ross Gear Tool Co., makers of Ross steering gears, are D. L. Ross, president; J. W. DeCou, vice president and general manager, Edward A. Ross, secretary; George C. Kumming, treasurer, and David E. Ross, consulting engineer. The organization of the Fairfield company is the result of the tremendous growth of the Ross Gear & Tool Co., which up to the present time has manufactured the differentials and bevel gears that will not be taken over by the new concern. Active management of the Fairfield organization will be under the direction of Mr. DeCou and Mr. Kumming. For the past year and a half Mr. DeCou has been factory manager of the Ross Gear & Tool Co. Prior to that time he was associated with the Smith-Form-a-Truck Co., and for eighteen years with the Thos. B. Jeffery Co., first as purchasing agent and later as factory manager. Mr. Kumming, who for the past thirteen years has been assistant treasurer of the Ross organization, will have charge of the business management and office organization of the new company.

Westinghouse Electric International Co. has recently opened a new office in the Royal Bank of Canada building in Havana, Cuba. This was found necessary because of the growing use in sugar mills and other enterprises in Cuba to Westinghouse electrical equipment. To form a closer relation with existing installations and to be of the fullest service wherever knowledge, training and skill can be useful in electrification will be the object of the force of the new office. J. W White, who has been located in Cuba for some time past as Westinghouse representative, is in charge of the new office. Mr. White's intimate knowledge of and close relation with, the industries in Cuba peculiarly fits him to cope with all the problems that may be encountered. He will be ably assisted by other special engineers; this, with the convenient location of the new office, will give to the many customers, friends, and to others interested in any form of electric development, a confidence which emanates from a first-hand knowledge of the good qualities and reliability of Westinghouse apparatus. A complete stock of catalogs and other descriptive matter will be maintained in the new office, where for the asking can be obtained complete information on everything electric, from an electric iron or fan to the powerful steam turbogenerators or electric locomotives.

Blaw-Knox Co., Pittsburgh, Pa., are sending out a neat little folder describing their products consisting of forms for all kinds of concrete construction. Fabricated steel, one of the principal products of the company, includes mill buildings, manufacturing plants, bridges, crane runways, trusses and other construction of a highly fabricated nature. The company also specializes in the design and fabrication of high tension transmission lines. A corps of highly trained engineers is maintained for consulting and designing services.

Current News

News of Construction Activities and Business Opportunities

EASTERN STATES.

Lynn, Mass.—General Electric Co. has completed arrangements for the erection of a new 1-story addition to its plant at North Easton, about 132 by 180 ft. The proposed new brick and steel addition to the plant of the company at Pittsfield, Mass., estimated to cost approximately $200,000, will be used for the manufacture of electrical porcelain specialties. C. C. Chesney is manager of the Pittsfield works. The company is also taking bids for the erection of the proposed addition to its Windsor, Mass., plant.

West Springfield, Mass.—Gilbert & Barker Manufacturing Co., Springfield, Mass., is having plans prepared for extensive additions to its local plant, for increased operations. The proposed work includes the construction of a new reinforced concrete iron and brass foundry, 400 ft. long; extension to its galvanized zinc plant; addition to the sheet metal department, about 160 by 229 ft.; extensions to storehouse, as well as the erection of an addition to the power plant for general factory service. The project, including machinery and equipment installation, is estimated to cost close to $1,000,000. The company manufactures pumps, oil-burning systems, oil and gas furnaces, etc. McClintock & Craig, 33 Lyman street, Springfield, are architects.

Hartford, Conn. — Southern New England Telephone Co., New Haven, has awarded a contract and broken ground for the construction of a 6-story and basement telephone exchange plant addition, about 33 by 90 ft. to its Pearl street, Hartford, Conn., establishment. The structure is estimated to cost about $65,000. The Ellison Construction Company, 112 Wellington avenue, Hartford, is the contractor.

Hartford, Conn.—Bryant & Chapman, Woodland and Homestead avenues, have had plans prepared for the erection of a new power plant.

Albany, N. Y.—Public Service Comsion (Second District) has authorized the Niagara & Erie Power Co., owned jointly by the Niagara, Lockport & Ontario Power Co., and the Buffalo & Lake Erie Traction Co., to issue $363,000 in 5 per cent 30-year bonds and $322,000 in 6 per cent two year notes. The order provides that proceeds of these securities are to be used for the construction of a second transmission line between Athol Springs and Dunkirk, extensions to distributing systems in Brockton and Ripley, in the towns of Hamburg, Eden and Brant, and for substantial improvements and additions for equipment at substations at Gardenville and Dunkirk.

Buffalo, N. Y. — In connection with the construction of the proposed new municipal hydroelectric power plant, it is understood that a total of about 4400 cubic feet of water will be utilized, as provided for under the Esch power bill, which will permit of the development of about 100,000 hp. This total hp. will be distributed in various localities in Western New York; Buffalo to receive about 31,000 hp.

Endicott, N. Y. — International Time Recording Co., North street, is having plans prepared for the construction of a new 3-story factory and boiler plant addition to its works, for increased capacity. The structure will be 50 by 200 ft., and will cost $450,000, including machinery equipment installation.

Jamaica, L. I., N. Y. — Multiple Storage Battery Co., Van Wyck avenue, has filed notice with the secretary of state of an increase in its capitalization from $50,000 to $200,000 to provide for general business expansion.

Jamestown, N. Y. — City lighting commission has voted $250,000 in bonds to improve the electric light plant. The commission will enlarge the city lighting plant to meet the tremendous demand for commercial service due to the announcement made by the Pennsylvania Gas Co. that it will shut off its supply from Jamestown, on May 1.

Jamestown, N. Y.—Crescent Tool Co., 200 Harrison street, is having preliminary plans prepared for the construction of a new forge shop and power plant at its local works, for increased forging operations and facilities. Cundall, Powell & Mosher, 80 West Genesee street, Buffalo, are architects and engineers for the company.

New York, N. Y.—Montreal Tramways Co., operating throughout the city of Montreal, Que., has arranged through New York bankers for a bond issue of $2,000,000, the proceeds of the bonds to be used for extensions and improvements in the company's system. E. A. Roberts is president.

New York, N. Y.—Brooklyn Bridge Freezing & Cold Storage Co., 11 Arch street, has had plans prepared for the construction of a new building at 24-26 Vandewater street, to cost about $25,000.

New York, N. Y.—Edison Fixture Co., 525 Broadway, has completed negotiations for the entire fourth floor of the building at 332 Broadway, for increased operations.

New York, N. Y.—Announcement has been made by the All-American Cables, 89 Broad street, that plans have been perfected for the extension of its cable system from Buenos Aires, Argentina, to Santos and Rio de Janeiro, Brazil. The work will require about 2600 miles of cable, and will be constructed in two sections. When completed United States will be in direct communication with Brazil over wholly American-owned cables. John L. Miller is president of the company.

North Tonawanda, N. Y.—It is understood that considerable electrical and mechanical equipment will be required in connection with the construction of the new plant for the Herschell-Spillman Co., contract for which has been awarded. The plant will cost about $200,000.

Rome, N. Y.—Rome Electrical Co., South Jay street, has awarded a building contract to the Rome Building & Service Co., 103 West Dominick street, for the erection of a new 1-story addition to its plant, about 50 by 90 ft., for increased operations. The structure will cost about $20,000.

Solsville, N. Y.—Solsville Electric Light & Power Co. is having plans prepared for the construction of a new addition to its local electric light and power plant to provide increased service. The structure will be of reinforced concrete type.

Syracuse, N. Y.—Iroquois Utilities, Inc., 514 City Bank building, has had plans prepared for extensions in its system for furnishing service to the town of Collins, Erie county. The company's plant is located at Gowanda, N. Y. The company has filed application with the Public Service Commission for permission to make the proposed extensions, as well as for approval of the franchise granted by the town officials.

Utica, N. Y.—Board of Managers of the Utica State hospital has commenced the construction of the new power plant at the Marcy division of the institution, and rapid progress is being made. E. S. Elwood, Capitol building, Albany, is secretary of the State Hospital Commission.

Camden, N. J.—Castle Kid Co. has awarded a contract to the William Steele & Sons Co., 1600 Arch street, Philadelphia, for the construction of an addition to its boiler plant to supply increased power facilities. The structure will be 1-story, reinforced concrete, about 28 by 45 ft., located at 1516 Broadway.

Freehold, N. J.—Board of Chosen Freeholders of Monmouth County has awarded all miscellaneous contracts in connection with the construction of a new municipal electric light and heating system for Main street, to facilitate the early completion of the works. The project is estimated to cost about $40,000. George W.

Henderson, Main street, Avon, N. J., has the general building contract.

Lakehurst, N. J.—United States Government, Bureau of Yards & Docks, has had plans prepared for the construction of a large electric power plant and distribution system (Specification 4128) at the local government station. The project is estimated to cost about $550,000. C. W. Parks is chief of the bureau.

Newark, N. J.—Contract has been awarded by J. Lichtman & Son, Frelinghuysen avenue, for the construction of a proposed new tannery and boiler plant addition to their works, estimated to cost about $130,000. The structure will be 2-story, about 85 by 225 ft. Emil Matzner, 671 High street, is the contractor.

Rockaway, N. J.—In arranging the annual budget for 1920, the Borough Council, has approved an appropriation of $2500 to be used for the operation of the street-lighting system during the year.

Trenton, N. J. — Trenton Radio club, located in the Central Y. M. C. A. building, has completed the installation of a quantity of new equipment. It is understood that the organization is considering plans for the construction of a new building at East State street and Clinton avenue, where a large and well-equipped laboratory will be maintained.

Trenton, N. J.—City officials have commenced active work on the proposed improvements in the electric street-lighting system. W. J. Seeley, Philadelphia, has been appointed as temporary inspector of the street-lighting system, and has assumed his duties in this connection.

Hauto, Pa. — Lehigh Navigation Electric Co. has commenced preliminary construction work on the proposed extension and enlargement of its local electric power station. The company plans approximately to double the present capacity of the plant, or from 30,000 to 60,000 hp. The installation will comprise a total of about 18 new boilers, 2 new turbo-generating units, as well as auxiliary equipment. It is also reported that the company is arranging for a housing development for its employes, as well as the erection of a new club house building. The entire project is estimated to cost approximately $3,000,000.

Marion, Pa.—City Council has had plans prepared for the installation of an electric-lighting system throughout the municipality, power to be furnished by the Hagerstown & Frederick Railway Co., Security, Md.

Murfreesboro, N. C. — Chowan Railway & Power Co. is having plans prepared for the construction of a new electric generating station for the furnishing of electric energy for the operation of its railway from Orlando, N. C., to Franklin, Va.

Philadelphia, Pa.—John C. Winston, director of public works, has awarded a contract to the Dravo-Doyle Co., Commercial Trust building, for the immediate installation of 4 new turbo-centrifugal pumping units at the Queen Lane pumping station of the bureau of water. The installation of the new equipment will increase the capacity of this station by 50,000,000 gallons daily, to be furnished in the territory south of Callowhill street. The work is estimated to cost $410,000.

Pittsburgh, Pa.—Clytex Petroleum & Natural Gas Co., a Delaware incorporation, has filed notice with the Secretary of State of an increase in its capital from $1,000,000 to $2,000,000, for general business expansion.

Pittsburgh, Pa. — Pittsburgh Reflector & Illuminating Co., 3117 Penn avenue, has taken bids for the construction of the proposed new 1-story plant, about 70 by 100 ft., to be located at Irwin, Pa.

Rochester, Pa. — Duquesne Light Co., Chamber of Commerce building, Pittsburgh, has awarded contracts for the construction of a new outdoor electric substation to be located at Junction park, Rochester, Pa. The structure will cost about $30,000. Plans have also been arranged by the company for the immediate construction of the proposed new substation at Ambridge, Pa., estimated to cost $20,000.

Baltimore, Md.—Baltimore Electrical Supply Co., 309 North Calvert street, has completed negotiations for the purchase of property at Calvert and Pleasant streets, to be used as a site for the construction of a new 5-story industrial building.

Baltimore, Md. — Eastern Rolling Mills Co., Baltimore street and Sewer road, is understood to be considering plans for the rebuilding of its electric generating plant recently damaged by fire with loss estimated at about $35,000.

Central Falls, R. I.—Rhode Island Glass Co., a division of the General Electric Co., has broken ground for the construction of a new 3-story steel addition to its local plant, about 50 by 96 ft., to provide for increased operations.

Providence, R. I.—F. L. Jenckes of the Jenckes Spinning Co., of Pawtucket, R. I., and several associates in the industry, will build a large automobile tire-fabric plant near Montreal. The mill, which will cost practically $1,000,000, will give employment to 1000 hands and will be operated along American lines.

Wheeling, W. Va. — Hazel-Atlas Glass Company is said to be considering plans for the purchase of the former electric light and city gas plant located in East Wheeling.

Folkston, Ga.—The city has voted $10,000 in bonds for water and light improvements. Address Mayor of Folkston for further information.

Amite, Fla.—Central Light & Power Co., contemplates improving plant, including the installation of additional machinery.

NORTH CENTRAL STATES.

Cleveland, O. — Directors of the Struthers Furnace Co. have authorized construction of a slag crusher, with auxiliary equipment, to involve investment of about $1,000,000, at the Anna furnace, operated by the company at Struthers, Mahoning county, Ohio.

Toledo, O. — Value of the Toledo Railways & Light Car lines, placed by company at $17,000,000, is set at $7,111,336 by city appraisers, who say city will need $12,000,000 altogether to condemn and acquire lines.

Warren, O.—Plans for new financing have been developed by the Packard Electric Co., Warren, O., which has increased its capital from $100,000 to $1,000,000 common and $500,000 of 7 per cent cumulative preferred. The company will issue $350,000 preferred stock, to be used for financing plant additions and to meet a bond issue of $95,000. None of the common stock will be issued. Officials say the company is six months behind in its orders. Its products are chiefly transformers, including heavy apparatus used in steel mills, and electrical equipment for automobiles.

Youngstown, O. — Three additional directors of Electric Alloy Steel Co., Thomas J. Bray, president of Republic Steel & Iron Co., S. P. Kerr, president of Sharon Steel Hoop Co., and S. Livingston Mather, secretary of Cleveland-Cliffs Iron Co., have been elected. Principal independent steel producers are represented on the board of the new company, which will build a plant for the manufacture of high speed and special analysis steels.

Anderson, Ind. — The employment of a consulting engineer to make a survey of the city lighting plant, with a view of its expansion, has developed the fact that the city board of works has planned for the expenditure of $350,000 in making the plant bigger and better. It is said the board has perfected arrangements whereby it can finance the undertaking and go through with the work mapped out.

Decatur, Ind. — David and James McNaughton, consulting engineers, are preparing plans for the building of the new power plant by the city of Decatur. As soon as they are compiled and accepted by the common council notice to bidders will be published and sealed bids received for the erection of the building and installation of the machinery. Estimated cost $150,000.

Evansville, Ind. — The Evansville Paper Box Manufacturing Co. will build a 2-story brick and steel plant, containing 300,000 sq. ft. of floor space.

Evansville, Ind. — Miller, Fullerwider & Dowling, Chicago, will draw plans for 4 new buildings to be erected on the Evansville College campus at a cost of approximately $400,000.

Indianapolis, Ind. — Vonnegut Machinery Co., dealers in machine tools, will erect a 2-story fire proof reinforced construction building to contain 60,000 sq. ft. of floor space. The building will be of heavy construction to permit adding several stories later.

Indianapolis, Ind.—The Pittsburgh, Cincinnati, Chicago and St. Louis Railway Co. has protested to the Indiana Public Service Co. against the proposal of the Utility Development Co., the Indiana Power Co. and the

Martinsville Gas and Electric Co. to construct a high-tension transmission line along the edge of the railway company's right-of-way from Martinsville to Worthington. The railway company takes the position that the proximity of the high power electric line to the railroad and its telegraph lines would be dangerous.

Seymour, Ind.—The high tension line recently built by the Interstate Public Service Co., between Seymour and Williams, Ind., has been placed in service and will carry current generated at Williams. It will be connected at Seymour with the transmission line between that town and Indianapolis, which has been in service for a number of months. The new high tension line will furnish power for a large territory in the south central part of Indiana.

Terre Haute, Ind. — Hoosier Rolling Mill Co. will erect a plant for the manufacture of merchant and structural steel, which will cost, when completed, between $2,000,000 and $3,600,000.

Alton, Ill.—Members of the State Street Improvement Association have subscribed $1950 for the maintenance of a white way on that street from Fourth street to the railroad tracks on Front street.

Bloomington, Ill.—Ballinger & McAllister will erect a 1000 barrel flour mill, 100,000 bushel concrete elevator and a 2-story brick and concrete warehouse, 34 by 150 feet, at Sheridan, Wyo.

Quincy, Ill.—Alderman Hyatt recommends extending the electroliers system on Main street. The Hyatt idea is to have meters installed at the water-works pump house and use current from the Keokuk dam under contract direct between the city and the Mississippi River Power Co., the motors to operate the street, alley and public building lighting systems, but not doing anything in the line of commercial lighting.

Wauwatosa, Wis.—Architect A. C. Eschweiler is preparing plans for a telephone exchange, the building to be one story high, of brick and concrete construction.

Detroit, Mich. — The Common Council voted to submit to the voters at the April election a proposal for a bond issue of $15,000,000 with which to build a municipally owned street railway system. The tentative plan calls for nearly 200 miles of new trackage to be operated in competition with the Detroit United Railway. The plan was drawn up by Mayor James Couzens and has the indorsement of the Detroit Street Railway Commission.

Pontiac, Mich. — Pontiac citizens have voted to grant a franchise to the Detroit United Railway to extend its lines in the city.

Ravenna, Mich. — Former State Senator Thomas Rogers is one of a syndicate that plans the construction of a hydroelectric plant at Ravenna, the proposed plant to be of 400 hp.

Isle, Minn. — The village is contemplating the installation of an electric lighting system. Power will be received from the Little Falls Light & Power Co. For further information address B. F. Frederickson, village recorder, Isle, Minn.

Paynesville, Minn. — Union Power Co. has purchased site and will erect a substation in the near future.

Redwood Falls, Minn. — Architect L. P. Wolff, 1000 Guardian Life building, is preparing plans for an ornamental street lighting system. Bids will be received in the spring. For information address H. C. Rutter, clerk, Redwood Falls, Minn.

Remsen, Ia. — The Granville-Remsen Telephone Co. has appointed a committee to negotiate for the purchase of the Remsen exchange.

Ash Grove, Mo.—Ash Grove Light & Power is having plans prepared for the rebuilding of its electric plant recently destroyed by fire with loss estimated at $30,000.

Buckner, Mo. — The Green Light Power Co. will place 24 additional ornamental lights.

St. Louis, Mo. — Century Electric Co., 1827 Pine street, has had plans prepared for the construction of a new 6-story and basement reinforced concrete manufacturing plant addition, about 106 by 180 ft., to be devoted to the manufacture of alternating current motors and fans. The proposed new plant is estimated to cost about $500,000. The Stone & Webster Engineering Corporation, Boston, Mass., is engineer for the company.

Sweet Springs, Mo.—City is planning a bond issue for $20,000, to provide for improvements in the municipal electric light plant. J. J. Smith is mayor.

Hutchinson, Kan. — The towns of Geneseo and Little River, Kan., have voted bonds to extend the line of the United Water, Gas & Electric Co. of Hutchinson, Kan., subsidiary of Cities Service Co., to a distance of about 14 miles north of the present line, which will bring it approximately 50 miles north of Hutchinson. An effort is also being made in four other towns west of Geneseo to vote bonds, and if these are carried the line will probably be extended another 40 miles west of Geneseo.

Hyannis, Neb. — Bids will be received during February for an electric light plant. Address W. H. Curtis, city clerk.

Schuyler, Neb. — Citizens have voted $55,000 in bonds to rebuild electric light plant.

Sioux Falls, S. D.—Two stone-crushing plants will be installed in the near future at Sioux Falls, requiring between 300 and 400 hp. of electric energy for their operation.

Fargo, N. D.—Fargo business men are interested in an artificial ice company which has recently been organized and capitalized at $300,000. The company will erect a modern ice and storage plant in the spring.

SOUTH CENTRAL STATES.

Georgetown, Ky. — City is understood to be having plans prepared for extensive improvements in the municipal electric-light and water-works plant, for increased operations. The work is estimated to cost $100,000.

Jackson, Ala.—A new franchise has been granted the Jackson Light & Traction Co. The company will now be able to go ahead with improvements held in abeyance pending the granting of the new franchise.

Kaplan, La.—Plans are under consideration by the city for the issuance of bonds for $40,000, the proceeds to be used for extensive improvements in the municipal electric-light and water-works system. Eugene Eleazar is mayor.

Little Rock, Ark. — Southwestern Bell Telephone Co. is understood to be arranging plans for extensive improvements and additions in its plants and system for increased operations, estimated to cost about $200,000.

Marianna, Ark.—Citizens of Marianna have bought all the stock in the Arkansas Light & Power Co. at a price said to be $48,000. Citizens interested in the deal are Dr. O. L. Williamson, W. D. Newbere, R. L. Mixon, M. H. Ford, J. B. Daggett, D. S. Plummer, C. E. Daggett and R. D. Smith. The new ownership plans many repairs to the plant.

Brady, Tex.—The Brady Water & Light Co. will construct an electric light plant at Brady. W. O. Kirchner is superintendent.

Fort Worth, Texas—The final survey for the proposed Fort Worth, Mineral Wells & Breckenridge Traction Co. interurban railway is now being made, and, according to H. E. Robinson of Fort Worth, president of the company, construction of the line will be started some time in February. The distance between Fort Worth and Breckenridge is about 100 miles.

Norman, Okla. — City Council has had plans prepared for the construction of a new municipal electric light and distribution system. The work is estimated to cost $125,000. W. R. Gater is city manager.

Okemah, Okla.—City is considering plans for the installation of a quantity of new equipment in the municipal electric light plant, including new boiler equipment, engines, generator unit, and auxiliary apparatus. E. W. Baker is in charge of the work.

Stroud, Okla.—Town Council is arranging plans for improvements in the municipal electric light plant, including the installation of new engine and generator units, for increased operations. W. A. Hadley is mayor.

Tulsa, Okla.—An electric generating station to cost $1,000,000 will be built by the Public Service Company of Oklahoma. The plant will be divided into three units for separate operation when necessary. The building for the entire plant will be of concrete, steel and brick construction, 70 by 100 by 165 ft.

WESTERN STATES.

Portland, Ore. — The Crystal Ice & Storage Co. will begin the construction of a new $60,000 plant in the near future.

Salem, Ore.—The Hunt Bros. Packing Co. will expend $125,000 for improvements in their plant, including further development of their power system.

Seattle, Wash. — The Pacific Telephone & Telegraph Co. will commence work at once on the erection of an 8-story building at a cost estimated at $1,000,000. Among the changes in the service planned with the occupancy of the new home, is the transformation of the present telephone system into an automatic system.

Sacramento, Cal.—R. G. McDonald, of Mina, Nev., has made application with the State Water Commission for 300 cu. ft. per sec. from West Walker river, for generation of power. The amount of water to be stored is 75,000 and 2000 ft., and will develop approximately 30,000 t.hp. of power. The estimated cost of the proposed works is $4,500,000.

Woodland, Cal.—The city trustees have made public an ordinance whereby an underground district in the city will be established, and provides for a conduit system for all electric lines. The cost of construction is estimated between $100,000 $125,000.

FOREIGN TRADE

[Addresses of firms referred to in these trade opportunities may be obtained by writing to the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch and local co-operative offices. Request for each opportunity should be on a separate sheet and the file number given.]

Motors, Dynamos, Cables, Electrical Instruments, Etc. (31,796).—An agency is desired by a firm in Spain for the sale of telephonic and telegraphic apparatus, field glasses for army use, goniometers, automobile trucks, motors, dynamos, cables, electrical instruments, and high-power searchlights suitable for army field operations. Quotations should be given c. i. f. Spanish port. Correspondence may be in English. References.

PROPOSALS

Electric Light plant—Sealed bids will be received by the City Commissioners of Madison, S. D., until Feb. 9 for furnishing materials and constructing buildings for the Municipal Electric Light Co.

INCORPORATIONS

Sacramento, Calif.—Articles of incorporation have been filed by the Sacramento Appliance Co., with capital stock of $50,000. Abe Leach, Harry E. Leach, and E. R. Cordan, all of Oakland, Calif., are the incorporators. The new company will handle electrical appliances of all sorts.

Gilbert, S. C. — Gilbert Electric Light & Power Co. has been incorporated with a capital stock of $3000 by K. B. Price and associates.

Evansville, Ind.—Standard Battery Association has been incorporated with capital stock of $50,000. Willard G. Trimm is president of the company.

Indianapolis, Ind.—C. W. Sammons Manufacturing Co. has been incorporated with capital stock of $50,000 with C. W. Sammons, E. M. Sammons, and A. A. Kaye, as directors.

Indianapolis, Ind.—Lewis & Milligan, Inc., has been incorporated with capital stock of $35,000 to operate metal and wood-working machines with Clio A. Lewis, James S. Milligan, and L. L. Paul as directors.

Bastrop, Tex. — The Consumers Light & Fuel Co. has been incorporated with capital stock of $50,000. The incorporators are L. S. Johnson, H. H. Handsby, and P. T. Cyrsup.

Snyder, Tex.—The Snyder Utilities Co. has been incorporated here with a capital of $50,000. Its purpose is to construct and operate public utility plants. The incorporators are: D. P. Yonker, W. B. McCormick, and E. P. Johnson.

New York, N. Y.—Stuyvesant Electric Manufacturing Co. Capital, $10,000. To manufacture electrical goods. Incorporators: S. Spitt, C. Coroff, and N. Portugal, 237 Seventh avenue.

New York, N. Y.—Manhattan Lamp Service. Capital, $25,000. To manufacture electric lamps, etc. Incorporators: W. Weimann, Jr., W. E., and D. F. Relihan, 71 Post avenue.

Poughkeepsie, N. Y.—Superior Carbon Products, Inc. Capital, $150,000. To manufacture carbon brushes, etc. C. E. Hastings is the principal incorporator.

Slaterville Springs, N. Y.—Caroline Farmers' Telephone Co. Capital, $20,000. To operate a local telephone system. Incorporators: G. M. and F. B. Bull, and C. M. Jones, Slaterville Springs.

Albany, N. Y.—Electrical Materials Corporation. Capital, $50,000. To manufacture electrical specialties, etc. Incorporators: J. J. Haggerty, K. F. Ruthenberg, and J. D. Hoit, Albany.

Rochester, N. Y.—Geer & Moore. Capital, $50,000. To manufacture electrical equipment, etc. Incorporators: S. L. Moore, M. F. Geer, and W. H. Burr, Rochester.

Passaic, N. J.—C. R. Newman & Sons, Inc. Capital, $100,000. To manufacture and deal in electrical supplies, etc. Incorporators: Charles R. Roland, and C. and Chester L. Newman.

Sardinia (Erie county), N. Y.—Holland-Sardinia Light & Power Corp. Capital, $150,000. To operate in Erie county. Incorporators: M. L. Harrington, J. G. Allen, and R. Phillips, Sardinia.

Pittsburgh, Pa. — Dawes Electric Sign & Manufacturing Co. Capital, $25,000. To manufacture electric signs and other electrical goods. J. L. Dawes is the principal incorporator.

Philadelphia, Pa. — Allied Electric Supply Co. Incorporated under Delaware laws with a capital of $100,000. To manufacture electric fixtures, supplies, etc. Incorporators: J. V. Pimm, E. M. MacFarland, and F. R. Hansell, Philadelphia.

Mullens, W. Va.—Union Power Co. Capital, $25,000. To operate a local electric light and power plant. Incorporators: Harrison B. Smith, D. W. Hill, and David C. Howard, all of Charleston.

Yakima, Wash.—Electric Power & Appliance Co. has been incorporated for $25,000 by Albert Schroeder, C. H. Kirby and Arthur L. Fullbright.

Jersey City, N. J.—M. W. Kellogg Co., 117 Westside avenue, manufacturer of piping and general power plant equipment, has filed articles of incorporation under the laws of the state of Delaware with a capital of $15,770,000.

Magnolia, Ark.—Consumers' Ice & Light Co. Capital, $75,000. To operate a local electric light and ice manufacturing plant. W. W. Sorrels, president; and W. R. Gantt, secretary-treasurer.

Broklyn, N. Y.—Electric Hand Lamp Manufacturing Co. Capital, $10,000. To manufacture electric novelties, specialties, etc. Incorporators: A. H. and L. Pfaendler, and M. Finkelstein, 1836 Fulton street.

New York, N. Y.—Kewanee Boiler Co., Inc. Capital, $100,000. To manufacture boilers, radiators and electric mechanical appliances. E. E. Baker, Kewanee, Ill., is the principal incorporator.

New York, N. Y.—H. F. Electric Co. Capital, $10,000. To manufacture electrical goods. Incorporators: H. Fischbach, M. Rothenberg, and M. Wolper, 547 Saratoga avenue, Brooklyn.

New York, N. Y.—H. S. Whiting Co. Capital, $15,000. To manufacture electric and gas fixtures, etc. Incorporators: H. S. Whiting, N. J. Peabody, and K. Vanpelt, 44 Whitehall street.

Newark, N. J.—Duplex Motor Engine Co. Capital, $125,000. To manufacture and deal in engines, etc. Incorporators: Hugh C. Barrett, R. F. Anthony and Michael Sugrue, Jr.

Philadelphia, Pa.—P. T. Henry Co. incorporated under Delaware laws with a capital of $100,000. To manufacture electric lamps, etc. Incorporators: P. T. Henry, E. R. Henry, and Thomas J. Leslie, Philadelphia.

Wilmington, Del.—Lincoln Motor Co. Capital, $24,000,000. To manufacture motors, engines, etc. Incorporators: C. H. Blaske, T. L. Croteau, and S. E. Dill, Wilmington.

Baltimore, Md. — Reus Electric Equipment & Battery Co., 154 West Mount Royal avenue. Capital, $150,000. To manufacture electrical equipment, batteries, etc. Incorporators: B. and John F. Reus, Jr., and S. Wilson Morrow.

Personals

New Head of Western Association of Electrical Inspectors Long in Industry—L. A. Furlong Made Cedar President

JAMES F. HAMILTON, Rochester, N. Y., president of the New York State Railways, has taken over the management of the Fourth and Madison avenue traction lines in New York City.

GUY E. TRIPP, chairman of the board of directors of the Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa., delivered an interesting address on the evening of Jan. 15, at the Stevens Institute Alumni dinner, New York City.

GEORGE G. BOWEN, former sales manager for the Northwestern Electric Co., Portland, Ore., has opened an office in the Spaulding building, that city, to act as sales representative for manufacturers of electrical appliances and specialties.

W. J. STANTON has accepted a position with the Ohio Brass Co., Mansfield, O. Mr. Stanton has been identified with the electrical industry for the last 20 years, having started with the General Electric Co. and remaining with it for a period covering 18 years in the testing, engineering and sales departments.

CHARLES EISLER, well-known expert on incandescent lamp making machinery, who has just completed a modern lamp factory for the Save Electric Corporation, has accepted a position as vice-president and consulting engineer of the Newark Engineering & Tool Co. now specializing on lamp machinery. Mr. Eisler for many years was connected with the Westinghouse Lamp Co.

THOMAS N. MEHAN is now a member of the sales organization of Paul W. Koch & Co, 19 South Wells street, Chicago, Ill., and will handle the local distribution of "Jiffy" tap, "Jiffy" bushing and clamp, and other electrical specialties for which the Koch company are sponsors. Mr. Mehan has been long and favorably known in the industry, having been connected with the Electric Appliance Co. for eight years.

JOHN A. STEVENS, vice-president of the American Society of Mechanical Engineers and consulting engineer in power-plant design and construction, recently opened an office in Fall River, Mass., to handle business in the southern New England district.

R. A. NEAL has been appointed manager of the switch section of the Westinghouse Electric & Manufacturing Co. to succeed F. A. McDowell, now manager of the new created cost and development section. Mr. Neal came to the Westinghouse company shortly after his graduation from New Hampshire State College in 1910 and has served in the various capacities of order man, inquiry man and assistant manager of the switchboard section.

LOUIS MAUE and EDWARD R. HEISER, Hazleton, Pa., have been appointed district business manager and district superintendent of distribution and high transmission, respectively, of the Harwood Electric Co. Mr. Maue and Mr. Heiser succeed Seth W. Brown, resigned.

L. A. FURLONG, who was elected president of the Northern White Cedar Association at its recent convention at Minneapolis, is vice-president of The Valentine-Clark Co. of Minneapolis, Minn. He became associated with the cedar business in 1906 with the MacGillis & Gibbs Co., and after remaining with this organization for a number of years, he joined The Valentine-Clark Co. on July 1, 1910, with whom he has since been connected. Mr. Furlong is looked upon as one of the most progressive and aggressive men connected with the production of cedar products and is becoming more and more a factor in the business.

L. A. Furlong.

J. G. MILES was recently appointed supply division manager of the Westinghouse Electric & Manufacturing Co. at Seattle, Wash., succeeding C. V. Aspinwall. Mr. Miles has seen long service in the supply department of the Westinghouse company, serving for several years as the head of the insulation section at East Pittsburgh, Pa. His thorough grasp of the details of supply work has been responsible for the upbuilding of a considerable portion of supply sales and also for the exploitation of many new products, some of the better known of which are the bakelite and bakelite micarta products, particularly as applied to insulation and gears.

K. W. ADKINS, elected president of the Western Association of Electrical Inspectors at the recent St. Louis convention, is 36 years old and has been engaged in electrical work for almost 20 years. Mr. Adkins was born in Clay County, Mo., and was educated in the public schools and at William Jewell College, Liberty, Mo. After leaving college he engaged in electrical construction work in Kansas City, Mo., remaining there until 1904, when he entered the employ of the Louisiana Purchase Exposition Co., St. Louis, in the power station department, remaining there one year, returning to Kansas City, where he spent a year in the employ of the Western Electric Co. In 1906 Mr. Adkins entered the employ of the Missouri Inspection Bureau, as electrical inspector in the engineer department and later was advanced to the position of engineer, which he now holds. He has been actively engaged for the past 14 years in fire prevention and fire protection engineering and is a member of the following organizations: Western Association of Electrical Inspectors, Electrical Committee of National Fire Protection Association, National Association of Electrical Inspectors and Underwriters' Uniformity Association.

OBITUARY.

HOWARD DUNLAP, president of the Emporia National bank, and dean of Kansas bankers, died at Emporia, Kan., Jan. 26. He assisted in the establishment of the first electric system, telephone and gas plants in Emporia and was a pioneer in electrical improvements in the community.

WALTER P. PHILLIPS, formerly an official of the Columbia Graphophone Co., died at Vineyard Haven, Mass., Sunday, Feb. 1. He was at one time general manager of the United Press and was the inventor of the Phillips code for telegraph operators. He was widely known in daily newspaper and telegraph circles.

PAOLO FISCHER, at one time an assistant to the well-known Italian electrician, Stassano, builder of electric furnaces, died recently in Chicago. Mr. Fischer was widely known in Europe in connection with the early development of electric furnaces. He also designed the furnace plant which was operated for some time at Buchanan, Mich., and more recently had designed a plant proposed for installation near the Keokuk dam.

J. C. JOHNSON, general manager of the Southern Utilities Co., Centerville, Ia., died Jan. 28 of influenza. He was 36 years of age and had been connected with the company since May, 1919. He won praise during the recent coal strike by his efforts in relieving suffering caused by the strike. The Southern Utilities Co. operates 30 miles of interurban lines and supplies power for 25 Iowa towns.

Financial News

Wisconsin Edison to Show Over $5 a Share for 1919.

Surplus after charges of Wisconsin Edison Co. for the 12 months ended Oct. 31, 1919, amounted to $1,131,464, equal to $5.26 a share on 215,000 shares outstanding. While the showing for the 10 months of the current year is only $623,459, equal to $2.90 a share, or at the annual rate of $3.48 a share, it is confidently expected that the company will show more than $5 a share for the whole of the 1919 year.

The discrepancy between the 10 and 12 months' figures is explained by the adjustment at the end of each year of such items as depreciation and interest. Miscellaneous income of the holding company is always the largest during December due to the adjustment of interest charges.

Comparative income account of Wisconsin Edison properties, inter-company dividends and interest eliminated, is as follows:

	1919.	1918.
October gross	$1,563,712	$1,279,956
Net after taxes, etc..	361,062	263,838
Surplus after charges	153,336	69,162
10 months' gross	14,326,788	11,736,041
Net after taxes, etc..	2,983,849	2,221,669
Surplus after charges	1,032,130	376,243
12 months' gross	17,183,091	14,056,522
Net after taxes, etc..	3,730,532	3,031,075
Surplus after charges	1,487,652	927,361

The income account of Wisconsin Edison Co. which includes miscellaneous receipts, compares as follows:

	1919.	1918.
October gross	$ 160,534	$ 82,409
Net after taxes	159,701	81,336
Surplus after charges	114,902	29,293
10 months' gross	1,105,619	562,024
Net after taxes	1,091,679	553,402
Surplus after charges	623,459	21,150
12 months' gross	1,740,870	1,150,249
Net after taxes	1,704,715	1,122,139
Surplus after charges	1,131,464	484,851

Earnings are showing improvement over last year, the average monthly increase in surplus for the 12 months ended Oct. 31, 1919, as compared with 1918, being $53,884, while for the 10 months' periods, the increase was $60,230. As October's figures were $85,600 this improvement is apparent, and lends credence to the expectations of those familiar with the company's affairs that a dividend close to $3 is not unlikely before the end of the year.

Dividends are declared only when directors deem it advisable. Thus far in 1919 only $1 was declared, payable July 1. This compares with previous declarations of $2 in 1918, $3 in 1917, $4.25 in 1916, $2.75 in 1915 and $1.75 in 1914. Surplus as of Dec. 31, 1918, was $1,351,142.

Rate increases were recently granted the Milwaukee Electric Railway & Light Co. by the Wisconsin Railroad Commission, Wisconsin being the only state that has tied together wages of labor and rates of charge for service.

The North American Co. owns approximately 186,300 of the total 215,000 shares outstanding. In addition the Wisconsin Edison Co. has outstanding $6,500,000 10-year 6% convertible gold debentures of May, 1924, which are convertible into stock at $80 a share prior to May 1, 1923, and are redeemable at 102 at any time upon 60 days' notice.

Inland Empire Company Reorganized.

Reorganization of the bankrupt Spokane and Inland Empire Railway system was made known with the filing at Spokane of articles of incorporation for the Spokane & Eastern Railway & Power Co. and the Inland Empire Railroad Co., the former being capitalized for $3,000,000 and the latter for $1,000,000. The Inland Empire Railroad Company will operate the present "Inland Division" of the company, comprising interurban lines to Moscow, Idaho and Colfax, Wash. The other company will operate other property of the concern, including the city street car system in Spokane, the Coeur d'Alene, Idaho, interurban line and the power plant. The property was recently purchased by the bondholders at receiver's sale. F. E. Conners, receiver, and Waldo G. Paine, traffic manager, are named as incorporators.

Public Service of Northern Illinois Offers Notes.

Halsey, Stuart & Co., Chicago, is offering in denominations of $1000, $500 and $100 three-year 6% collateral gold notes, Series "D" of the Public Service Co. of Northern Illinois at 97.34 and interest. The notes are a direct obligation of the company and are collaterally secured by pledge of $133⅓ par value of its first and refunding mortgage 5% gold bonds and each $100 par value of notes issued, the bonds thus being pledged at 75. These notes being a lien through pledge of first and refunding bonds, rank ahead of $2,997,700 6% debentures, as well as $7,672,000 preferred stock, paying 6% dividends, and $12,075,000 common stock paying 7% dividends. The Public Service Co. of Northern Illinois operates in 15 counties in northeastern Illinois, having a combined population of 759,655, excluding the city of Chicago.

Canada Trade Increases.

Canadian trade statistics for 1919 show a material increase over 1918. Imports increased by $31,000,000 and exports by $51,000,000. Aggregate imports totaled $941,007,700 and exports $1,294,920,372. Duty collected amounted to $168,920,659. The export trade with the United States increased $21,504,145.

Mahoning & Shenango Company Changes Name.

At the annual meeting of Mahoning & Shenango Railway & Light Co. stockholders voted to change the name to Pennsylvania-Ohio Electric Co. The change was made because the new name is more thoroughly descriptive of the territory served and of the services rendered by the company. Directors of the company were re-elected.

General Electric May Sell New Stock at Par.

General Electric Co.'s inflow of orders is now running at the unprecedented rate of $300,000,000 annually and to handle this enormous volume of business the company is confronted by the necessity of additional financing which is expected to take the form of a new stock issue at par to meet the $15,000,000 three-year 6% notes, due July 1, 1920. On Dec. 1, 1919, General Electric retired its $10,000,000 two-year 6% notes, but order bookings have grown to such tremendous proportions that to pay off the July maturity in cash would leave the company embarrassed for working capital. General Electric had outstanding as of Dec. 31, 1919, about $120,000,000 capital stock. To raise $15,000,000 on a basis of this capitalization would involve the sale of 150,000 shares of additional capital stock, at the ratio of one share to the holder of eight, making the rights worth close to $9 a share at current market prices for the stock.

Shrinking Coin Worries World.

Dispatches received in Washington this week demonstrate the alarm with which the whole world is watching the money exchange situation. From every country come reports that the governments are seeking some method, no matter how drastic, to stop the rapid decline in the value of their moneys. Great Britain's financial leaders are in daily conference on the subject and Switzerland is preparing to proclaim a moratorium to save its clock industries.

The wide effect of the present situation was reflected in the New York Stock Exchange early this week when new low records for British, French, Belgian, Italian and Danish exchange were established.

One of the greatest factors in the decline of foreign money is the fact that America's trade balance against Europe increased by $4,435,410,566 in 1919. Figures issued by the Department of Commerce showed that exports from the United States were $5,185,980,350, while imports were $750,569,784.

The balance in favor of the United States over the United Kingdom piled up during the year was $1,969,988,783, that over France $769,497,587, and that over Italy $383,628,396. A trade balance of $82,137,085 also was registered over Germany.

Exports to the United Kingdom in 1919 were valued at $2,279,178,048 and imports from the United Kingdom were valued at $309,189,265. The figures for France were $893,368,996 in exports and $123,871,409 in imports, while for Italy they were $442,676,842 in exports and $59,048,446 in imports. Exports to Germany were valued at $92,761,314 and imports were valued at $10,624,229.

American Gas & Electric Notes Sold.

William A. Reed & Co., bankers, have purchased $4,000,000 American Gas & Electric Co. 1, 2 and 5 year 6% secured notes. All of the 5-year maturity, $500,000, have been sold privately. The remaining $3,500,000 notes are being offered at 99.05 and interest for 1 year, and 98 and interest for the 2-year notes. Proceeds of the sale of this note issue will be used by the company for redemption of $2,500,000 notes maturing Jan. 1, 1920, and for other corporate purposes. The company has shown steady increase of net earnings since 1909 and for 12 months ended Oct. 31, 1919, reported largest earnings in its history.

Cities Service to Offer $10,000,000 Debentures.

Henry L. Doherty & Co., as managers, are forming a syndicate for the sale and distribution of $10,000,000 principal amount Cities Service Co., Series "D" 7% convertible gold deventures, dated Dec 1, 1919, and maturing Jan. 1, 1966. The debentures will be offered at par and interest. They will be convertible at option of the holder on and after Jan. 1, 1922, into $925 par value either Cities Service preference "B" or preference "BB" stock and $75 par value Cities Service common stock, together with all accumulated cash and stock dividends on $75 par value common stock from Dec. 1, 1919, up to the time of conversion, for each $1,000 principal amount.

Early in 1918 Cities Service Co. offered Series B 7% convertible gold debentures at par, which are now bid 158. Early in 1919 the Series C debentures were offered at par, and these are now bid 105½. Net earnings of Cities Service Co. for the 12 months ended Oct. 31, 1919, available for payment of interest were more than 7 times the requirement for payment of interest on all debentures now outstanding, including those now being offered. At present prices of Cities Service Co. stocks the conversion privilege on the Series D debentures would give a present value in excess of par and one-half, and the dividend accumulation factor at the present price of Cities Service common would add to this in excess of 5 points by Jan. 1, 1921.

Hurley Machine Dividend.

Directors of the Hurley Machine Co. have declared an initial quarterly dividend of $1 a share on the new common stock of no par value, which was recently exchanged 7 shares for one of the old $100 par value common stock. The present dividend is equivalent to 28% on the old stock, on which the last quarterly dividend was at the rate of 8%. Net sales

For the Readjustment Period—What?

Hands Across the Sea

The National Foreign Trade Council, which will hold its forthcoming annual convention in San Francisco on May 12 to 15, has invited special trade advisors from foreign countries. Many merchants in other lands plan to take advantage of that opportunity to meet American business leaders and American firms having representatives in foreign fields are also asking them to visit this country during the convention.

Some thirty foreign nations will have trade advisors at this convention according to an announcement made by James A. Farrell, chairman of the National Foreign Trade Council, an organization composed of seventy-five leading American merchants and manufacturers engaged in export trade. Trade advisors are expected from the following countries: Canada, Mexico, Panama, Salvador, Honduras, Costa Rica, Guatemala, Nicaragua, Dominican Republic, Colombia, Venezuela, Ecuador, Peru, Bolivia, Brazil, Paraguay, Uruguay, Argentina, Chile, Australia, New Zealand, Tasmania, Straits Settlements, Dutch East Indies, Indo-China, India, Siam, Siberia and the Philippines.

O. K. Davis, secretary of the National Foreign Trade Council, announces that ten trade advisors were being allotted to every foreign nation, commercial representatives of which have been invited to the convention. They will be chosen by trade organizations in their respective countries.

"These foreign trade advisors," says Mr. Davis, "will be thoroughly representative of the international commerce of their respective countries. They will be at San Francisco for the purpose of supplying first hand information in regard to the markets of their respective countries. They will not be official Government representatives, but commercial delegates in the true sense of the word.

"The seventh national foreign trade convention will be a gathering of representatives of all phases of the international commerce of the United States. Delegates will attend from all parts of the country, and the opportunity of acquiring foreign trade information will, this year, be an exceptional one, if only through the presence of trade advisors from the various foreign nations."

Manufacturers of electrical machinery and appliances should be among the first to take full advantage of the opportunities which this great convention offers.

C. A. TUPPER - - - President
INTERNATIONAL TRADE PRESS, Inc., Chicago

so far this year are nearly double those of the corresponding period in 1918.

Detroit Edison to Expand.

Detroit Edison Co. has filed an application with the Michigan Public Utilities Commission asking authority to increase its capital stock from $35,000,000 to $60,000,000 and to sell convertible 10-year 7% debenture bonds to an amount not exceeding $5,929,000. Funds are needed to make extensions, it is alleged in the application, made necessary by the rapid growth of the city.

Earnings.

DETROIT EDISON CO.

Detroit Edison Co. has issued its annual report for the year ended Dec. 31, 1919, showing surplus after charges and taxes of $2,556,735, equivalent to $9.93 a share earned on the $25,742,700 capital stock as compared with surplus of $2,394,223 of $9.31 a share in the preceding year.

The income account for the year ended Dec. 31, 1919, compares as follows:

	1919.	1918.
Gross revenue	$16,498,391	$13,801,527
*Net revenue	4,278,318	3,747,990
Surplus after charges	2,556,735	2,294,223
Dividends	2,058,531	2,055,625
Surplus	498,204	338,598

*After expenses and depreciation.

ADIRONDACK ELECTRIC POWER CO.

	1919.	1918.
November gross	$ 170,702	$ 183,538
Net after taxes	80,758	70,135
Surplus after charges	56,315	47,801
12 months' gross	1,729,010	1,825,950
Net after taxes	633,136	344,751
Surplus after charges	339,903	87,574

THIRD AVENUE RAILWAY SYSTEM.

	1919.	1918.
November gross	$ 975,364	$ 781,242
Net after taxes	160,094	109,111
Deficit after charges.	49,496	97,625
5 months' gross	5,060,447	4,190,950
Net after taxes	845,051	727,026
Deficit after charges.	183,693	311,343

NEWPORT NEWS & HAMPTON RY., GAS & ELEC. CO.

	1919.	1918.
November gross	$ 205,670	$ 230,307
Net after taxes	53,329	51,790
Surplus after charges	27,383	30,635
11 months' gross	2,510,793	1,996,921
Net after taxes	635,514	536,946
Surplus after charges	372,126	317,513

AMERICAN TELEPHONE & TELEGRAPH.

Earnings:	Year 1919.	4th quarter 1919.
Dividends	$16,461,670	$ 8,563,248
Interest and other revenue	19,904,396	6,785,861
Telephone traffic (net)	5,962,505	3,631,903
Compensation account government contract	28,132,559	.....
Total	$70,461,130	$18,981,012
Expenses	10,235,669	2,237,188
Net earnings	$60,225,461	$16,743,824
Deduct interest	15,847,596	4,673,183
Balance	$44,377,865	$12,070,641
Deduct dividends	35,356,334	8,839,261
Balance available for reserves and surplus	$ 9,021,531	$ 3,231,380

COMMONWEALTH POWER, RAILWAY & LIGHT CO.

Earnings of Commonwealth Power, Railway & Light Co. and subsidiaries, compare as follows:

	1919.	1918.
November gross	$2,446,264	$2,022,847
Net earnings	948,325	831,227
Surplus after charges	237,526	174,310
Balance after pref. div.	147,761	*84,545
12 months' gross	25,555,103	21,735,128
Net earnings	10,482,941	8,387,671
Surplus after charges	2,248,275	921,352
Balance after pref. div.	1,171,095	*155,827

*Deficit.

NEVADA-CALIFORNIA ELECTRIC

Combined earnings of Nevada-California Electric Co. and subsidiaries, inter-companies' items eliminated, compare as follows:

	1919.	1918.
November gross	$ 181,203	$ 150,299
Net after taxes	88,819	72,244
Deficit after charges.	*2,298	*2,413
11 months' gross	2,361,211	1,994,576
Net after taxes	1,294,362	1,032,951
Surplus after charges	326,375	198,341

*After appropriation for redemption of bonds.

PHILADELPHIA RAPID TRANSIT.

	1919.	1918.
November gross	$3,055,953	$2,717,880
Net after taxes	990,814	923,359
Total income	1,032,344	979,401
Surplus after charges	218,989	170,866
11 months' gross	32,216,937	28,253,423
Net after taxes	10,122,756	9,584,135
Total income	10,606,098	10,151,657
Surplus after charges	1,682,748	1,325,663

GREAT WESTERN POWER.

Earnings of the Great Western Power system compare as follows:

	1919.	1918.
November gross	$ 581,781	$ 481,417
Net after taxes	324,737	291,895
Surplus after charges	128,993	120,272
12 months' gross	5,324,667	4,624,313
Net after taxes	3,088,072	2,666,999
Surplus after charges	938,071	812,271

GENERAL GAS & ELECTRIC CO.

Earnings of the Pennsylvania Utilities System, subsidiary of General Gas & Electric Co., compare as follows:

	1919.	1918.
December gross	$ 173,133	$ 160,581
Net after taxes	54,517	34,304
12 months' gross	1,822,318	1,604,295
Net after taxes	556,075	354,672

CONSUMERS POWER CO.

Earnings of this subsidiary of Commonwealth Power, Railway & Light Co. compare as follows:

	1919.	1918.
November gross	$ 804,655	$ 654,640
Net earnings	447,377	379,318
Surplus after charges	281,142	209,665
Balance after pref. div.	230,645	159,450
12 months' gross	8,054,839	6,489,942
Net earnings	4,259,704	3,347,079
Surplus after charges	2,058,772	1,447,609
Balance after pref. div.	1,453,705	878,534

UNITED GAS & ELECTRIC.

Earnings of subsidiary operating companies of United Gas & Electric Corporation compare as follows for December and 12 months ended Dec. 31:

	1919.	1918.
December gross	$1,071,005	$ 891,770
Net after taxes	370,399	281,555
Surplus after charges	221,522	130,486
12 months' gross	10,454,340	8,974,089
Net after taxes	3,671,920	2,992,448
Surplus after charges	1,850,961	1,219,522

Surplus after charges is available for reserves for renewals and replacements.

Earnings of U. G. & E. for the 12 months ended Dec. 31, 1919, (excluding subsidiary companies showing a deficit) show balance after deductions for replacements, etc., of $1,055,578. Other income amounted to $242,075, making total income $1,297,653. After deductions for interest on United Gas & Electric bonded indebtedness, the balance applicable to U. G. & E. is $546,843.

UNITED GAS & ELECTRIC.

Earnings of subsidiary companies for November and 12 months ended Nov. 30, compare as follows:

	1919.	1918.
November gross	$ 980,350	$ 834,614
Net after taxes	376,896	242,368
Surplus after charges	222,261	107,665
12 months' gross	10,275,105	8,834,525
Net after taxes	3,582,470	2,970,747
Surplus after charges	1,765,083	1,224,842

Surplus after charges is available for reserves for renewals and replacements.

Earnings of United Gas & Electric subsidiaries for 12 months ended Nov. 30, 1919, (excluding subsidiary companies showing a deficit), show balance, after deductions for replacements, etc., of $1,009,466. Other income amounted to $152,344, making total income $1,161,810. After deductions for interest on United Gas & Electric bonded indebtedness, the balance applicable to United Gas & Electric is $410,881.

KEYSTONE TELEPHONE.

Keystone Telephone Co. earnings for November and 11 months compares as follows:

	1919.	1918.
November gross	$ 139,634	$ 129,051
Net after taxes	49,430	50,543
Surplus after charges	14,868	21,907
11 months' gross	1,490,515	1,456,612
Net after taxes	491,559	595,301
Surplus after charges	163,545	279,799

WEEKLY COMPARISON OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeller & Co., Rookery Bldg., Chicago.

Public Utilities.	Div. rate. Per cent.	Bid Jan. 27.	Bid Feb. 3.
Adirondack Electric Power of Glens Falls, common	6	14	14
Adirondack Electric Power of Glens Falls, preferred	6	78	78
American Gas & Electric of New York, common	10+extra	125	125
American Gas & Electric of New York, preferred	6	39	39
American Light & Traction of New York, common	..	190	190
American Light & Traction of New York, preferred	6	89	88
American Power & Light of New York, common	4	66	66
American Power & Light of New York, preferred	6	72	72
American Public Utilities of Grand Rapids, common	..	8	8
American Public Utilities of Grand Rapids, preferred	7	20	20
American Telephone & Telegraph of New York	..	97¾	99⅝
American Water Works & Elec. of New York, common	..	2	2
American Water Works & Elec. of New York, particip	7	6	6
American Water Works & Elec. of New York, first preferred	..	48	48
Appalachian Power, common	..	3	3
Appalachian Power, preferred	7	20	20
Cities Service of New York, common	+extra	402	400
Cities Service of New York, preferred	6	71½	71½
Commonwealth Edison of Chicago	8	107	107½
Comm. Power, Railway & Light of Jackson, common	..	18	18
Comm. Power, Railway & Light of Jackson, preferred	6	43	41½
Federal Light & Traction of New York, common	..	7	7
Federal Light & Traction of New York, preferred	..	42	42
Middle West Utilities of Chicago, common	2+extra	21	20
Middle West Utilities of Chicago, preferred	6	45	42
Northern States Power of Chicago, common	..	60	59
Northern States Power of Chicago, preferred	ex.div.7	88	87
Pacific Gas & Electric of San Francisco, common	..	57	55
Public Service of Northern Illinois, Chicago, common	7	78	78
Public Service of Northern Illinois, Chicago, preferred	6	88	83½
Republic Railway & Light of Youngstown, common	4	14	14
Republic Railway & Light of Youngstown, preferred	6	44	44
Standard Gas & Electric of Chicago, common	..	25½	25½
Standard Gas & Electric of Chicago, preferred	6	40	41
Tennessee Railway, Light & Power of Chattanooga, common	..	1	1
Tennessee Railway, Light & Power of Chattanooga, preferred	6	7	7
United Light & Railways of Grand Rapids, common	4	28	26
United Light & Railways of Grand Rapids, preferred	6	60	60
Western Power of San Francisco, common	..	21	21
Western Union Telegraph of New York	extra	86¼	86½
Industries.			
Electric Storage of Philadelphia, common	4	129	128
General Electric of Schenectady	8	168	166
Westinghouse Electric & Mfg. of Pittsburgh, common	7	53¼	53⅜